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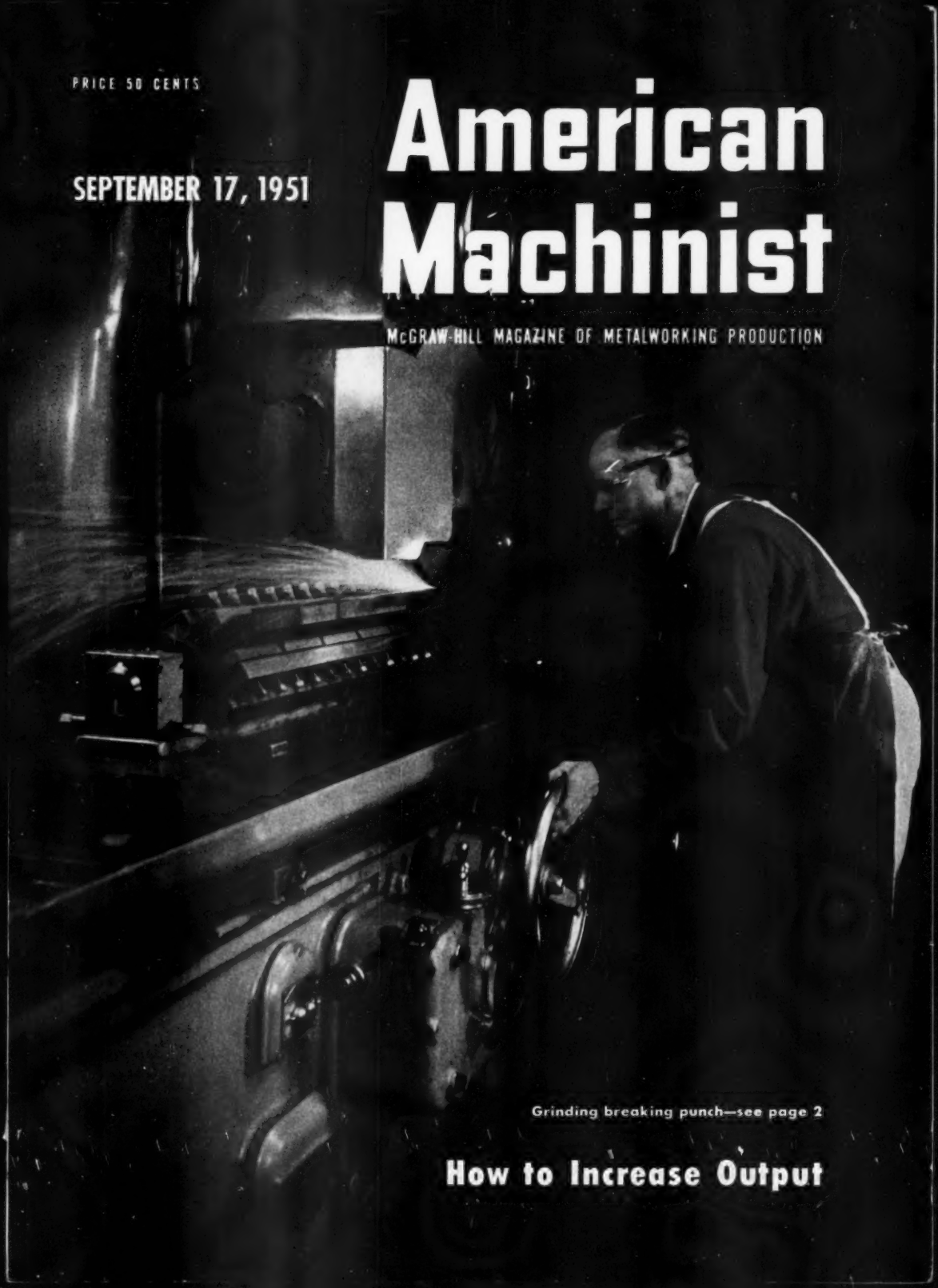
SEPTEMBER 17, 1951

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Grinding breaking punch—see page 2

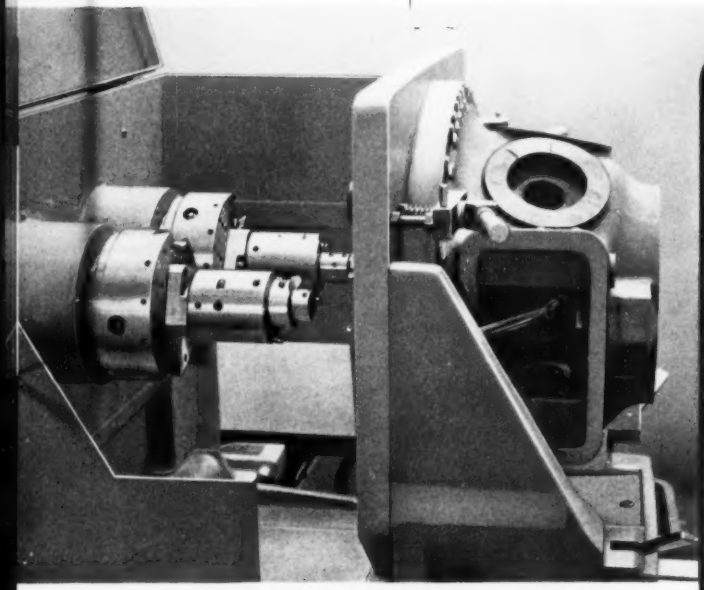
How to Increase Output

When the heat's on for civilian or defense production

HEALD PRECISION helps to KEEP 'EM FLYING

In aircraft production, quality and precision take precedence over all other factors. But *speed* can be mighty important, too. Heald machines meet *both* of these requirements — turning out precision finished parts with the highest degree of accuracy, at production rates consistent with customer requirements.

Whether it's a reciprocating or jet type engine — for civilian or military use — Heald can supply the equipment and experience that will smooth the way to faster, easier and better production. Remember — when it comes to precision finishing, it pays to come to Heald.



Heald Model 321 Bore-Matic performs multiple precision borizing operations on magnesium accessory cases for aircraft engines.

New Heald Bore-Matic Gets Aircraft Engine Production off to a Flying Start

HERE'S WHY

1. *Ready Adaptability* of Heald engineering to new applications.
2. *Smooth Performance* of basic machine and equipment.
3. *Constant Feed Hydraulics* maintain consistent feed rates throughout longest runs.

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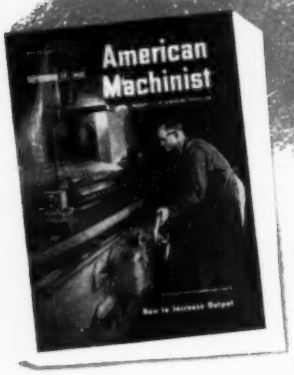


Chips and QUIPS

Sparks . . . Our cover Ektachrome shows a press-brake punch-and-die grinding operation at Lyon Metal Products, Inc., where the older planer-grinder method has been replaced by a Mattison grinder equipped with a simplified fixture. Setup time is only a few minutes because blocks help line up fixture with the table. On the illustrated job, this system beats the old time (15 hrs) by 12 hrs. You can barely see the transparent plastic eye shield; but the headband shows up.

Not Spectacular . . . Too often methods engineers search for drastic, unusual ways to accomplish cost savings. But even the well-managed large plant can usually increase output by only checking over the most obvious opportunities. To prove this point, N. M. Perris and H. K. Keever, partners in Stevenson, Jordan, and Harrison, Inc., (see biog.) well-known management engineers, cite examples that are common to most plants; and they present sketches to show just what they mean.

Engine Quality . . . When an automobile manufacturer scraps a proven line of engines and designs a new series from the ground up, he stakes his reputation and his future sales on the outcome. *AM* editors thought an analysis of how Chrysler engineers went about producing the new 180-hp V-8 Firepower engine would reflect some of Detroit's skill at making highly accurate parts on a high-production basis; so that's the story in this issue's Special Report. Chrysler takes no chances on missing design limits: For what appears to be the first time in automotive history, pistons and blocks are checked at constant temperature—assuring perfect classified assembly under 0.0005-in. limits. Fixed gages for engine-component inspection have virtually been eliminated and replaced by air and electric gages that make no human errors and are faster.

Metallurgy . . . Continuing the Shaw-Smith series on the influences of metal properties on machining, Part II covers steel structure and alloying elements, cast iron, and tool materials. Setting the stage for later coverage of metal-cutting mechanics, the article takes up microstructure and the ways tool material affects cutting rates and tool wear.

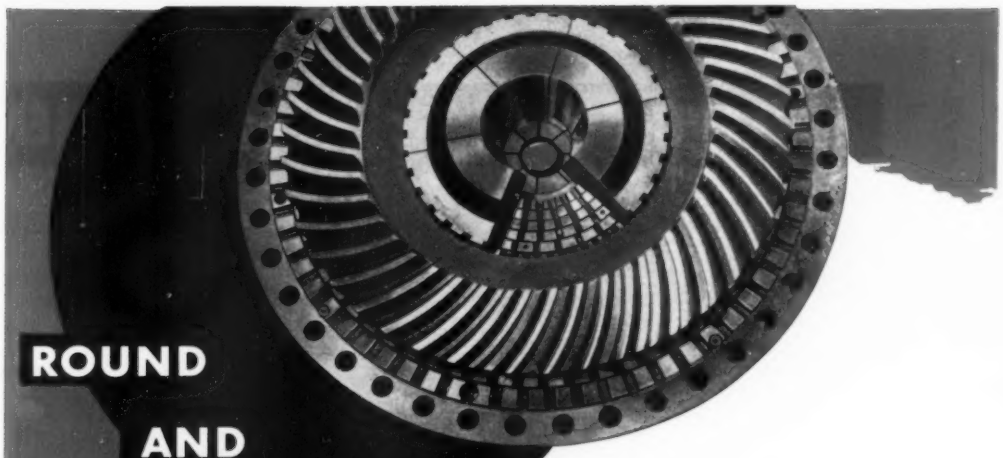
Rubber Blanking . . . Second operations on ornamental products are a headache—and they eat up profits, too. How to properly set up tools when blanking with rubber dies to avoid this trouble is discussed by Haim Murro of Jerusalem, and he also explains what tool properties are best for thin gages.

Workloaders . . . Materials handling is just as much a part of the complete job layout as tooling. A quick one-pager, for example, illustrates a Westinghouse setup where a 5-hr supply of 2-in. pipe is held in automatic loader that feeds a shotblasting machine. On the tooling side, there's a two-pager presenting a rotary-broach setup that cuts tangs on sleeves and tool shanks; combining fast rotation and many-edge broach cutting. Induction and flame hardening are often mysteries—both as to how they work, and why they sometimes don't. An article by John Obrebski introduces an interesting theory that explains such hardening questions in terms of "positive" and "negative" heat. Quite ingenious.

Coming . . . *AM* for Oct 1 will be almost a non-tooling issue, for a change; although you can't count out Practical Ideas. The Special Report will be on problems in a heat-treat shop; discussed by T. A. Frischman of Eaton Mfg. Company. Along with it, a short on heat-treating a large tank by blowing hot air into it. Another feature will be on lubricants for metal cutting, and other articles will cover quality control in a forge shop, machining compacted parts before they are sintered, and the new "Sigma" process for welding aluminum tank cars.

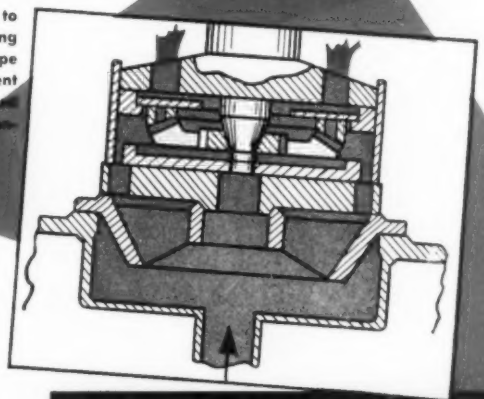
NORRIS M. PERRIS . . . Senior partner in Jordon & Harrison, Inc., has been in industrial engineering for 35 years. Started with the firm as a staff engineer 26 years ago. M.E. graduate of Case Institute; later took post-graduate courses at U of Penn, receiving a Masters degree in Economics. Taught "Factory Management" there at the time. Early training with Alcoa as industrial engineer. Was Proving Ground Officer, U.S. Army, during World War I. Vice-president and board member of the Association of Consulting Management Engineers.

HERBERT K. KEEVER . . . Graduate University of Cincinnati in 1922. Started with Cincinnati Milling Co. in the shop engineering dept. From 1925 to 1929, industrial engineer to one can-making machinery division of Continental Can Co. Joined Stevenson, Jordon & Harrison, Inc., as staff engineer in 1929; became a partner in 1941. Has spent all of his time in the metal trades since leaving college. Our lead article is gleaned from the experience of Messrs. Perris & Keever.



ROUND AND TRUE *with* DISTORTION-FREE QUENCHING

When hardening of metal parts is required, the first thought is to prevent distortion. Gleason quenching presses hold parts being quenched between dies which maintain the original shape throughout a metallurgically correct oil flow. This die equipment conforms to the actual shape of the part, and does not obstruct free oil flow over and around the part. It maintains true concentric shape of the part during the entire quench.



Timing cycle begins and quenching oil is forced into quenching chamber and around gear. Quantity and time cycle are under positive control during complete quenching cycle.

In the Gleason No. 36 Quenching Press parts up to 36" may be hardened. Among the many advantages which the 36" Press provides are:

- Controlled quenching at faster and safer production
- Simplified set-ups
- Metallurgically correct oil flow
- Safer loading
- Quenching without distortion

Write for literature. Send in prints of parts to be quenched for our recommendations.

BUILDERS OF BEVEL GEAR MACHINERY · GLEASON · FOR OVER EIGHTY-FIVE YEARS

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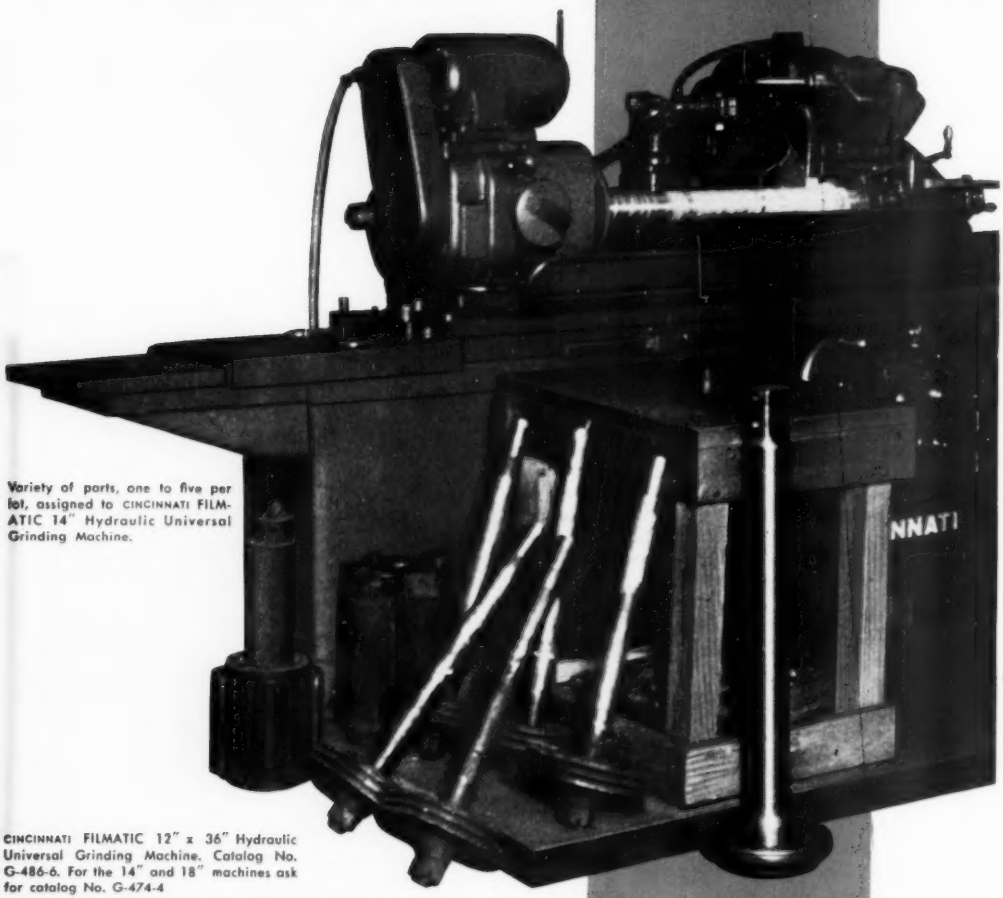
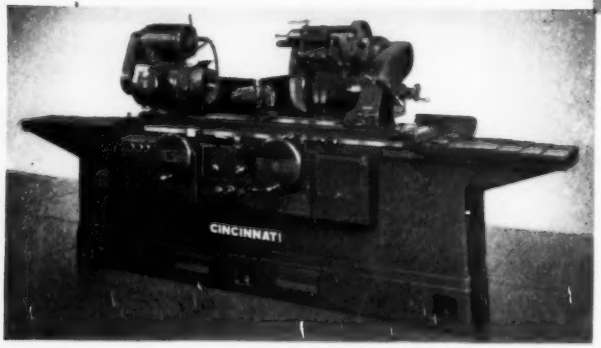
KEEPING COSTS down WHEN



Variety of parts, one to five per lot, assigned to CINCINNATI FILMATIC 14" Hydraulic Universal Grinding Machine.

CINCINNATI FILMATIC 12" x 36" Hydraulic Universal Grinding Machine. Catalog No. G-486-6. For the 14" and 18" machines ask for catalog No. G-474-4



CINCINNATI

CINCIN

CENTERTYPE GRINDING MACHINES
CENTERLESS LAPPING MACHINES

VARIETY GOES UP

Costs usually vary in proportion to the variety of operations assigned to one machine. The way to change this mathematical relationship is with equipment offering an exceptionally high degree of versatility. Then variety can go up rapidly with a much smaller resulting increase in cost. ¶ CINCINNATI FILMATIC Hydraulic Universal Grinders, especially the 12", 14" and 18" sizes, have many features of versatility and quick setup which keep costs at a minimum.

FILMATIC Grinding Wheel Spindle Bearings: the most versatile in any grinding machine, are self-adjusting for stock removal and quality of finish desired.

Hinged Internal Grinding Head: ready for internal grinding jobs at a moment's notice. Just swing it down and tighten one bolt.

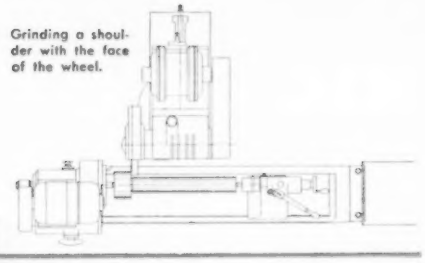
Speed Ranger Headstock Drive: instantaneous finger-tip selection of infinite number of speeds; AC motor.

Standard Headstock Spindle Nose: receives standard chucks; quick change adapter available.

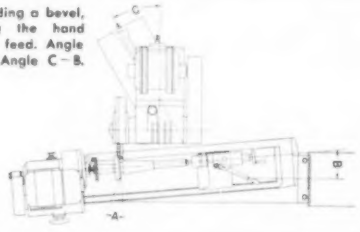
Wide Angle Swivel Adjustments of wheelhead and headstock. Advantages of this construction are shown in the drawing.

Other ways in which CINCINNATI FILMATIC 12", 14" and 18" Hydraulic Universal Grinding Machines can reduce costs in your shop are outlined in two attractive catalogs. They're yours for the asking: 12" machine, No. G-486-6; 14" and 18" machines, No. G-474-4.

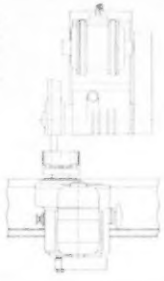
CINCINNATI GRINDERS INCORPORATED, CINCINNATI 9, OHIO



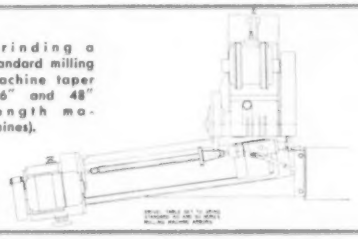
Grinding a shoulder with the face of the wheel.



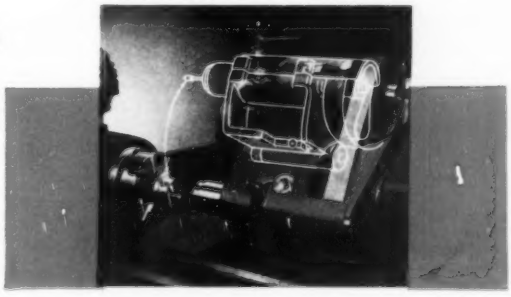
Grinding a bevel, using the hand cross feed. Angle A = Angle C − B.



Grinding the face of a part. The headstock has been swiveled 90° for this operation.



Grinding a standard milling machine taper (36" and 48" length machines).



Internal Grinding Head. When not in use it is in the up position—out of the way for external work. Pulling it down and locking it into position for internal grinding requires but a minute or less.

NATI

FILMATIC

CENTERLESS GRINDING MACHINES
MICRO-CENTRIC GRINDING MACHINES

BIG '36' GEAR SHAPER cuts

- The quick assumption that a machine with 36" dia. x 6" face width capacity would not be efficient on small gears... IS WRONG!

Here is specific evidence to the contrary: ----------

PHOTO BY COURTESY
NATIONAL ACME COMPANY
CLEVELAND, OHIO
Makers of Multiple Spindle Bar and Chucking Machines

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

SMALL GEARS faster, too!

SPECIFICATIONS:
STEEL . . . . . SAE 4150
PITCH 8/10
PRESSURE ANGLE . . . 20°
NO. OF TEETH 47
HELIX ANGLE . . . . 23°
TOOTH DEPTH . . . .235"
6.075"
Cutting Time:
10 Minutes . . on the new
36-Type Gear Shaper
17.2 minutes . . . . . by next best alternate method
24 minutes . . . . . on still another machine
(all methods @ 2 gears per load, one cut)

This super-rigid big machine can take heavy cuts at high speed, and still hold fine finish . . . Work can be stacked up to 6" face width. Quick set-up, via shift-lever, dial-set and push-button controls. Choice of 12 cutter spindle speeds (18 to 300 strokes per min.) and 12 rotary feeds . . . The most versatile of all-purpose Gear-shapers! . . . *Contact our nearest representative for additional information. He will be glad to assist you in lowering your gear production costs.*

Fellows

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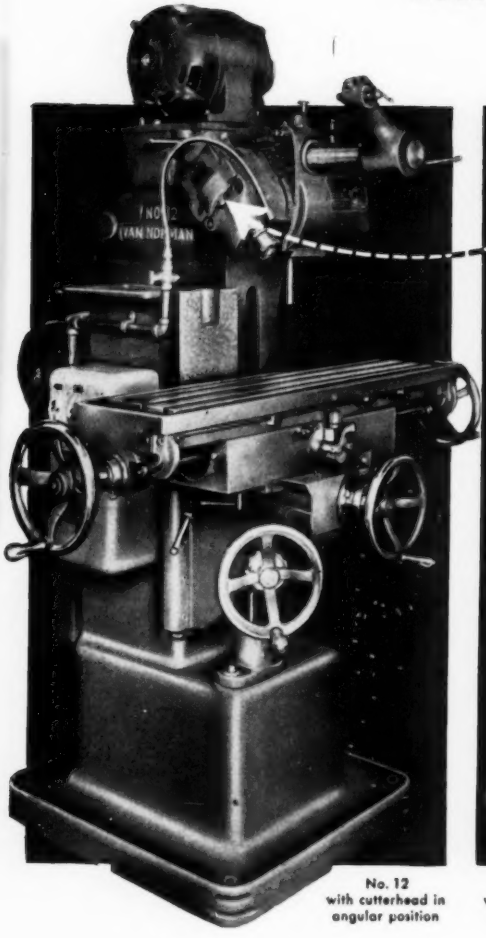
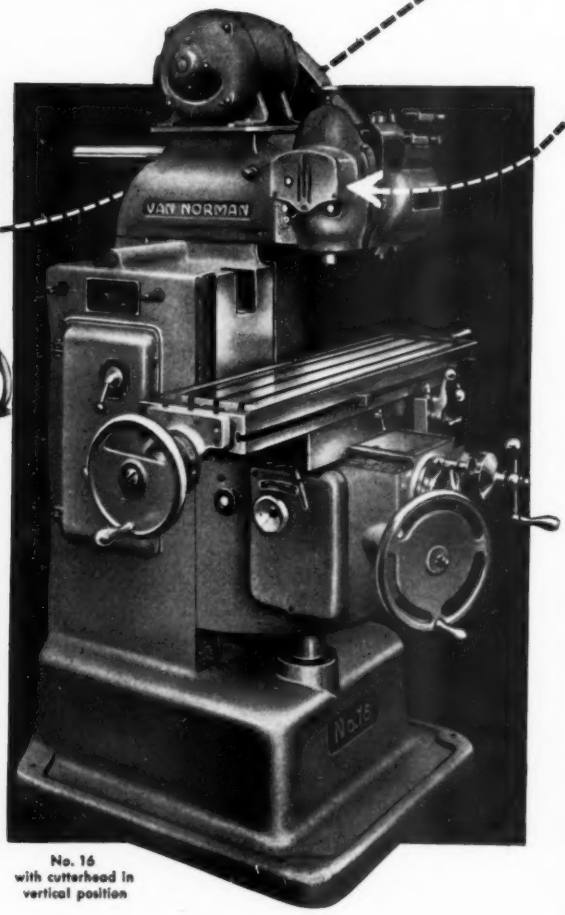
These Two

Van Norman Millers

Will Keep Your Production Up on Light and Medium Milling



No. 12
with cutterhead in
angular position



No. 16
with cutterhead in
vertical position

The Adjustable Cutterhead Eliminates Idle Machine Time . . . Meets All Milling Requirements

Here are two Van Norman Ram Type Millers, No. 12 and No. 16 that provide definite contributions to faster, more economical milling of small and medium size parts.

Featuring the adjustable cutterhead, which permits conventional horizontal, angular and vertical milling on one machine, these millers cut idle machine time by as much as 50%.

The movable ram in combination with the saddle cross feed increases the work capacity of the millers . . . enables you to handle all types of work pieces with ease.

Van Norman features include — rugged column and base, hardened alloy steel gears, multi-splined shafts, easy-to-read dials, large hand wheels, heavy knee, saddle and table assembly, anti-friction bearings, ease of operation.

See for yourself how these machines cut costs, improve accuracy and increase production in the toolroom, machine shop, laboratory and pattern shop and on the production line. Write for catalog today.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDIS "AUTOMATIC" ... POINTS

LANDIS *Machine* COMPANY

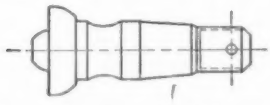
LANDIS TRADE MARK REG. U.S. PAT. OFF.

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING

PROVED BY PRODUCTION

AND THREADS 1020 BALL STUDS PER HOUR

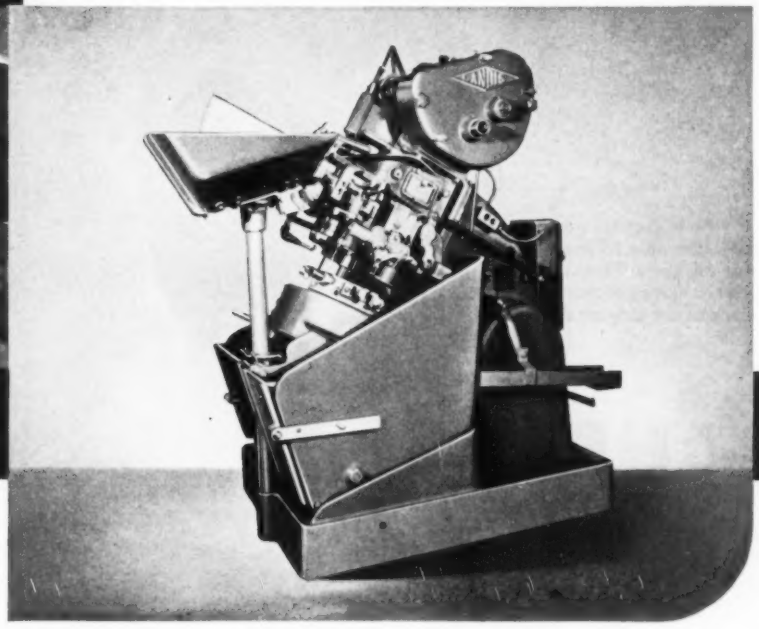
Through the use of LANDIS Automatic Forming and Threading Machines, a large manufacturer has solved his problem of mass-producing certain automotive parts.



The workpieces are cold-forged ball stud blanks. Specifications require a 45° point and a 9/16" 18-pitch NF thread cut to a length of ⅝". In constant daily operation is a battery of LANDIS Automatic Forming and Threading Machines, each of which point and thread 1020 pieces per hour. Four hours of production are obtained between chaser grindings, resulting in low tool cost and minimum machine down time.

Because of their universal features, LANDIS Automatic Forming and Threading Machines are adaptable to mass-production operations on a wide range of automotive parts. By means of pick-off speed change gears, the machine cycle can be varied to accommodate any combination of thread length, pitch, and thread diameter, within the capacity of the machine—therefore this machine is adaptable to a wide variety of work. Hopper feed and automatic operation throughout enable one operator to keep a battery of machines in constant production, while set-up changes of all types can be made in minimum time.

Can you revolutionize your pointing and threading operations with LANDIS Automatic Forming and Threading Machines? Please give specifications when writing for complete information.



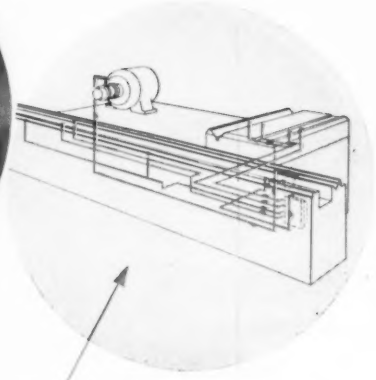
WAYNESBORO PENNSYLVANIA

EQUIPMENT

6 REASONS FOR INCREASED GRINDING

LANDIS TOOL 10" x 48" Type CH Plain Grinder. Catalog B-50.

EYE LEVEL WHEEL FEED and grinding visible to operator at all times. Eliminates awkward movements and reduces chance of work spoilage.



CONTROLLED WAY LUBRICATION assures proper lubrication at all times. Pressure safety switch eliminates chance of damaging accurate ways.

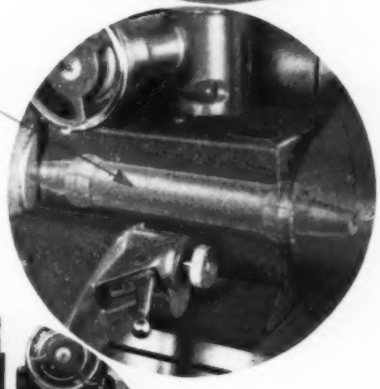
LANDIS TOOL

Precision Grinders

PRODUCTION

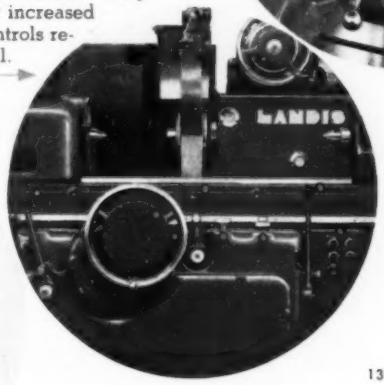
with new LANDIS TOOL 10"-14" plain grinders

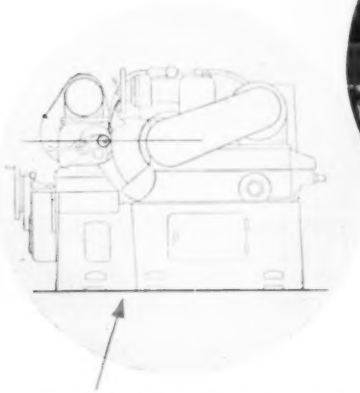
HYDRAULIC OPERATION Landis designed and built hydraulic system noted for simplicity of control and extra-smooth dependable operation.



MICROSPHERE WHEEL SPINDLE BEARINGS plus heavy duty wheel spindle proved in use by over 10,000 successful installations.

CENTRALIZED CONTROLS reduce setup and operating time for increased production. Simple controls require less operator skill.



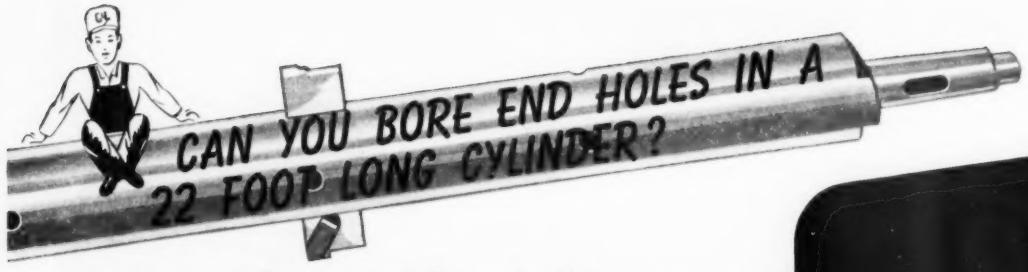


LOW WORK HEIGHT from floor to work centers shortens work handling time and reduces operator fatigue.

139

A new catalog is available which describes these features in more detail, plus specifications. Ask for Catalog B-50.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA. / U. S. A.



You Can on G & L Machines

OPEN STRUCTURE SIMPLIFIES WORK MOUNTING IN PRESENTING STAINLESS STEEL TANK TO MACHINE SPINDLE

The obsolete way to do this job is to dig a pit in the shop floor, or to rig up a machine on a balcony. But why do work the hard way? It's easier and far more practical to quickly remove the end support column on a G. & L. machine and extend the part horizontally just as this food processing tank is handled. Setup, machining and floor-to-floor time is drastically reduced with a better overall job resulting. Then—

ADDED ADVANTAGES OF USING THE G. & L. MACHINE FOR A BROAD RANGE OF WORK RESULTS . . .

Including operations on the stainless steel agitator shown. All milled surfaces on this part are held parallel and flat. Operations are completed in approximately four hours, which include the setup and four positionings of the arms.

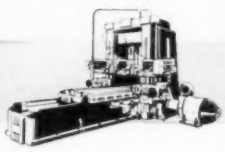
Liberal machining latitude is offered all G. & L. machine users. Through the machine's flexibility and versatility it is possible to produce more parts in less time at less cost. Don't let the machining of odd shaped or unusual parts stymie your production men. G. & L. engineers will help you find a way to handle such work, just as they have helped countless other companies.

G&L

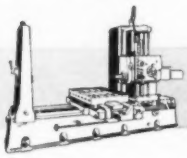
GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN, U. S. A.

HYPRO DAVIS

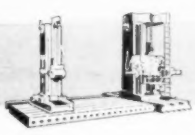
G. & L. HYPRO Double Housing Planer



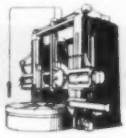
G. & L. Table Type Horizontal Boring Machine

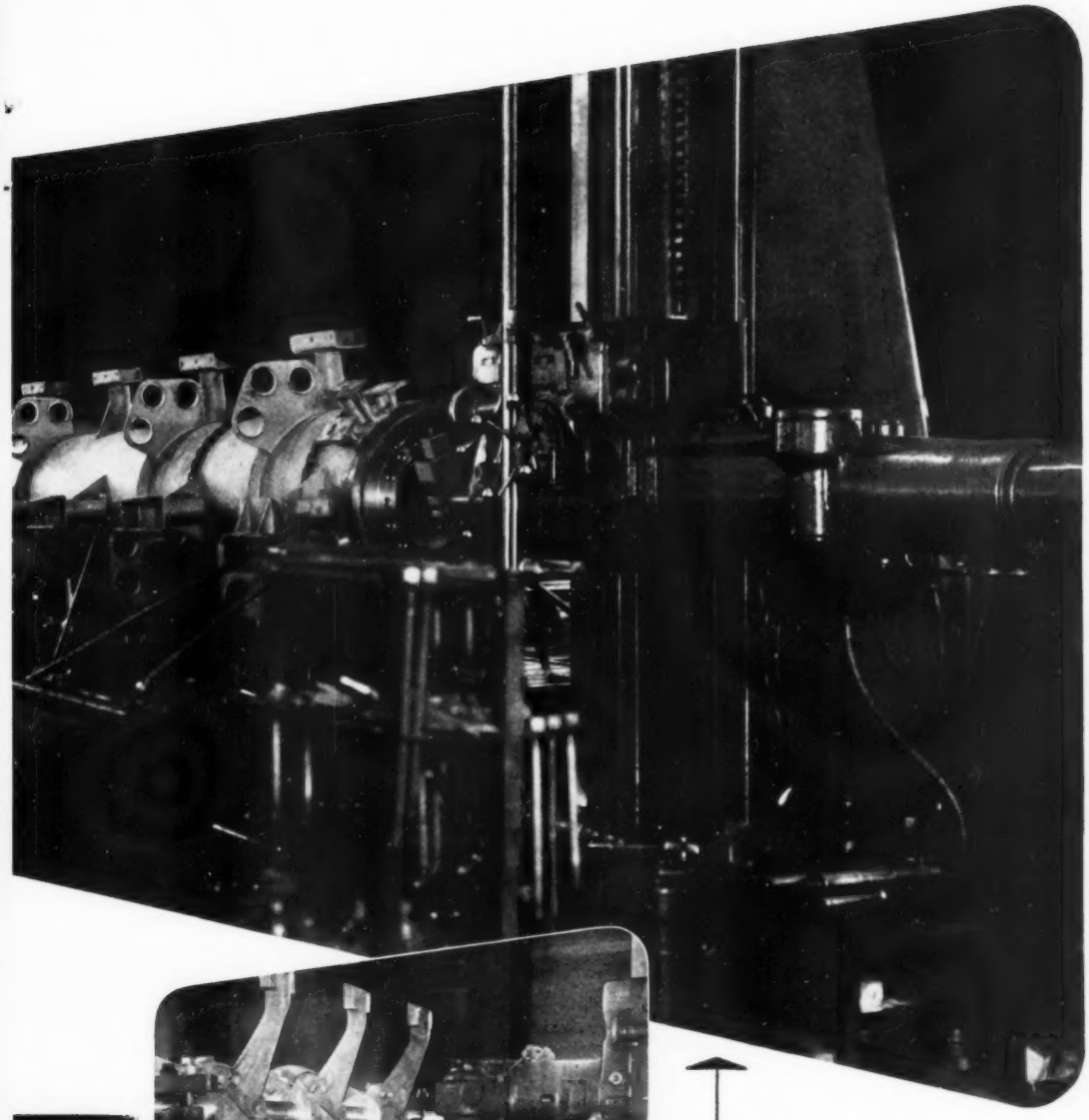


G. & L. Floor Type Horizontal Boring Machine

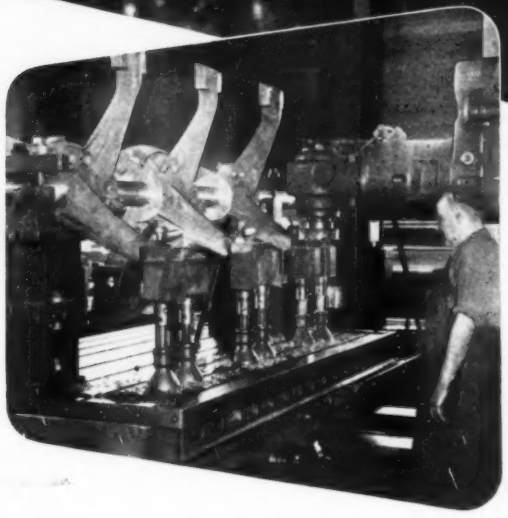


G. & L. HYPRO Vertical Boring and Turning Mill





Ability to produce stainless steel parts like this tank for the food processing industry indicates the importance of G. & L. machines for handling unusual work.

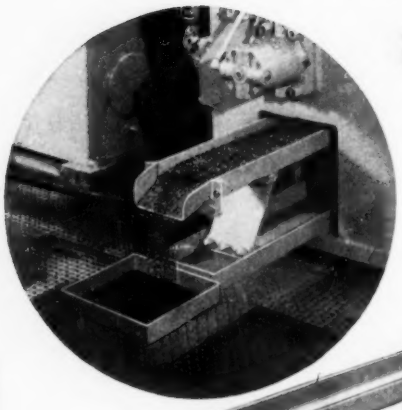


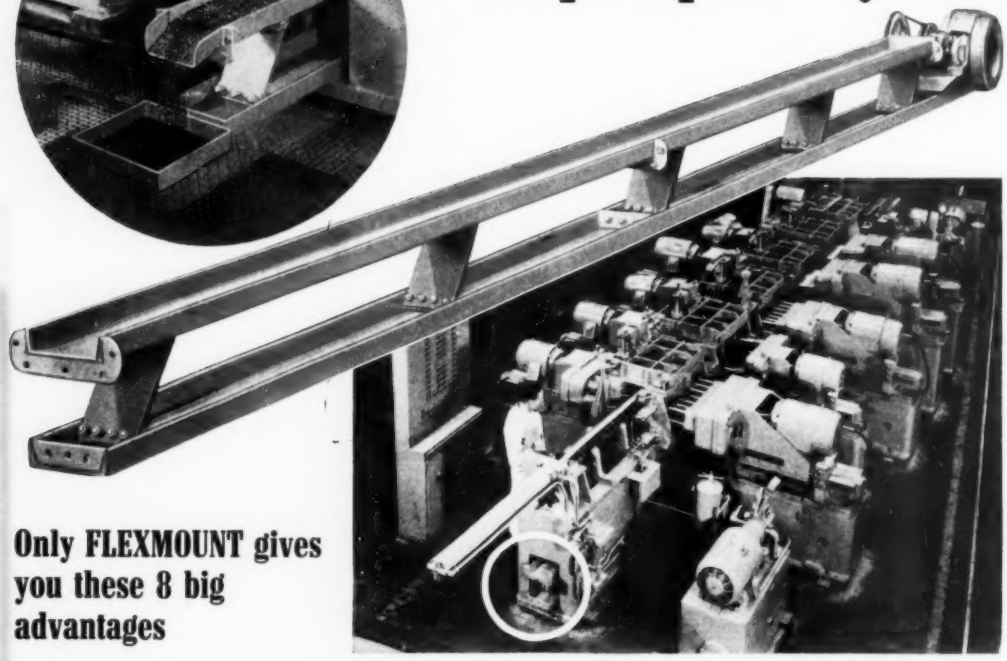
An angular milling attachment adds to the machining range of this G. & L. horizontal boring, drilling and milling machine.

Photo Courtesy ...
Buffalovak Equip. Div., Blaw-Knox Co., Buffalo, N. Y.

ANNOUNCING...

a remarkable, new chip-disposal system





FLEXMOUNT Oscillating Conveyors built into Cross automatic transfer-type machines for automotive production.

Only FLEXMOUNT gives you these 8 big advantages

1. POSITIVE ACTION. Uniform, continuous chip flow is assured regardless of load. Natural spring action reduces horsepower requirements to a minimum.

2. LEAK-PROOF. Trough is a single piece of metal. No coolant drip between machine and drain point. No return run.

3. COMPACT. A "natural" for restricted space. Opening need be only slightly larger than trough.

4. LONG LIFE. Minimum of moving parts. No joints or bearings in contact with material. The resilient legs that provide spring action last indefinitely.

5. LOW MAINTENANCE. Operates at low speed. Only drive need be lubricated.

6. SAFE. No moving parts in conveying trough.

7. JAM-PROOF. Reduces production stoppages. Handles bolts, nuts, bars, broken tools and even rags.

8. VERSATILE. Various widths, standard lengths up to 100 ft., with one drive. Dividers can be installed to convey simultaneously two or more materials, such as brass and steel chips, without mixing.

Link-Belt FLEXMOUNT Oscillating Conveyor is simple, compact... offers real savings in carrying off and collecting ferrous and non-ferrous chips

HERE'S the latest advance in chip disposal for high-production metal-working shops. Leading auto makers and machine tool builders are rapidly standardizing on new Link-Belt FLEXMOUNT Oscillating Conveyors—as integral equipment and as collecting conveyors for carrying chips to a central disposal point.

Check the outstanding operating advantages shown at left. See for yourself how the Link-Belt FLEXMOUNT meets the modern demand for improved chip handling.

LINK-BELT

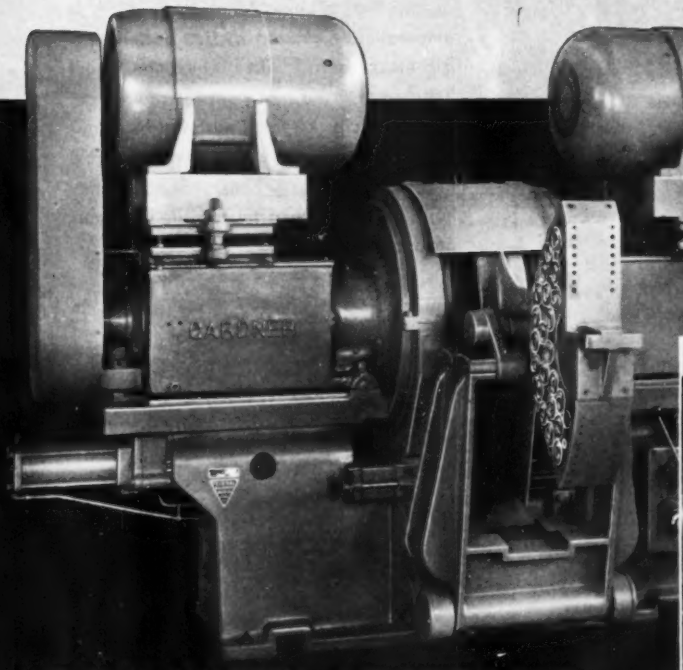
FLEXMOUNT OSCILLATING CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12.412

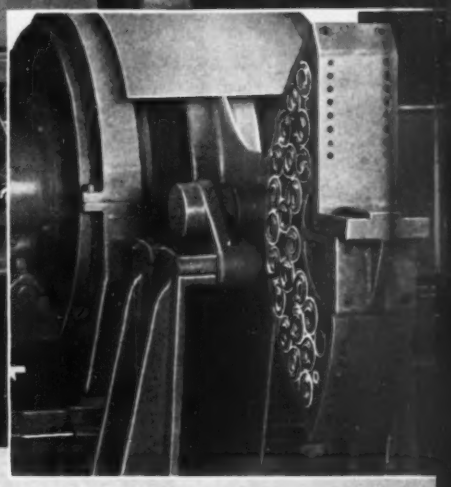
GARDNER precision disc Grinders

Unit Costs Reduced Grinding 600 Heavy Coil Springs Per Hour

TWO ends of each spring ground in ONE operation



Gardner 120A-30" Double Disc Precision Grinder. 1/8" max. stock removal grinding 2 1/2" O.D. steel springs 1/2" diameter wire. Power oscillated swinging arm work carrying fixture.



Indexing-type fixture permits operator to load and unload while grinding.

103 M

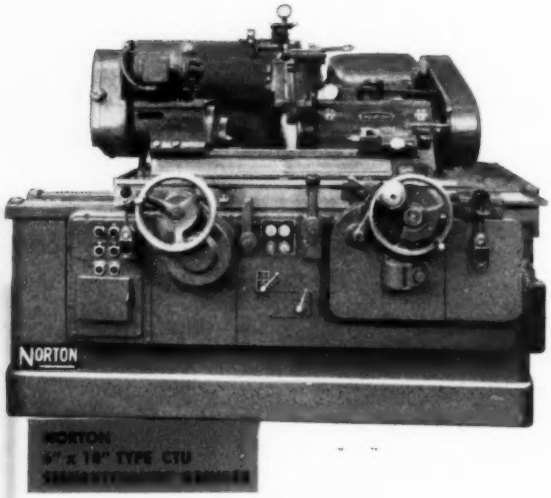
Request bulletin No. 12-7.

GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.

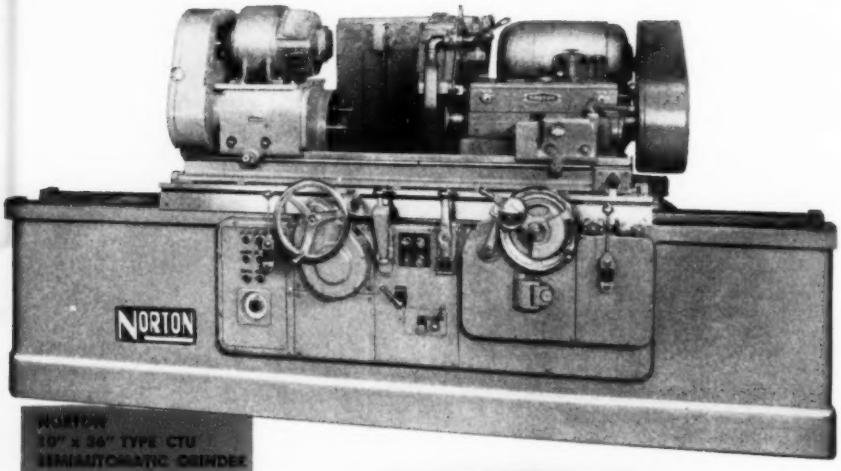
DO YOU WANT MORE GRINDING PRODUCTION..

You can make it easier for your operators to produce more with less effort—with NORTON 6" and 10" TYPE CTU SEMIAUTOMATICS



NORTON
6" x 18" TYPE CTU

These Norton Cylindrical Grinders begin paying for themselves right at the start — by easing the operator's job and enabling him to produce more with less effort. With either the 6" or 10" Type CTU machines, he loads the workpiece — touches a lever — and the machine takes over. Work is *automatically* ground to size under electric timer control, after which the wheel head resets itself ready for the next cycle. The simplicity of this "push-button" control, accompanied by a grinding cycle that is mechanically consistent hour after hour, is designed to put profits into your production.



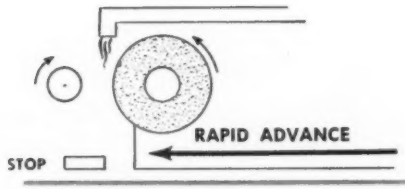
NORTON
10" x 36" TYPE CTU
SEMIAUTOMATIC GRINDER

NORTON
GRINDERS and LAPPERS

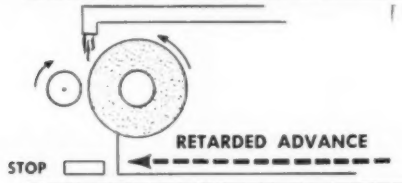
Making better products to make other products better

.. WITH LESS EFFORT?

touching one lever
produces these automatic functions . . .

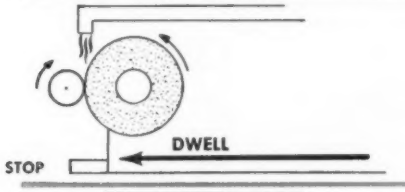


Work rotation starts.
Coolant flows.
Wheel advances rapidly.

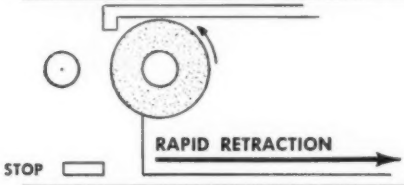


Wheel advance retarded.
Wheel continues to advance
at grinding speed.

Grinding continues to
preset positive stop.



Wheel dwells for size
and finish.



Wheel retracts rapidly.
Work rotation stops.
Coolant shuts off.

M-601

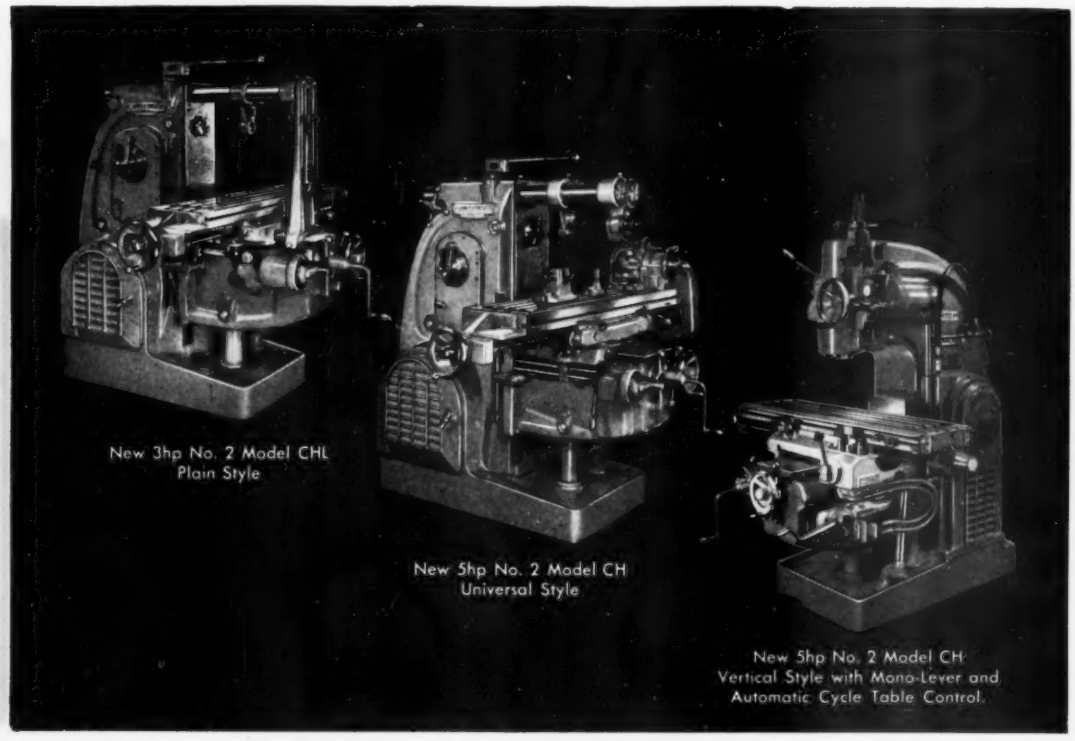
NORTON COMPANY, WORCESTER 6, MASS., U. S. A.

District Sales Offices

HARTFORD NEW YORK CLEVELAND CHICAGO DETROIT

Kearney & Trecker Announces . . .

THREE NEW KNEE


New 3hp No. 2 Model CHL
Plain Style
New 5hp No. 2 Model CH
Universal Style
New 5hp No. 2 Model CH
Vertical Style with Mono-Lever and
Automatic Cycle Table Control.

The specifications below point up the new larger working ranges of these new Kearney & Trecker machines. You'll find these larger working ranges provide you with new major cost-cutting possibilities for both tool-room and production work — long or short runs. Feeds and speeds listed are standard ranges. Optional ranges are available at extra cost.

Machine	Working Surface	TABLE Power Feed Travel		Feeds Number & Range	Power Rapid Traverse — " Per Min.	SPINDLE Nat'l Std. Taper	Speeds — Number and Range
		Plain & Universal	Vertical				
No. 1 Model CH Plain, Universal and (swivel head) Vertical	40" x 10½"	Long. 22" Cross 8"	22" 10"	16—½" to 32"	150"	40	16 — 25 to 1500 RPM
		Vert. 17"	16"	16—¼" to 16"	75"		
No. 2 Model CHL Plain, Universal and (swivel head) Vertical	46" x 10½"	Long. 28" Cross 10"	28" 10"	16—½" to 32"	150"	40	16 — 25 to 1500 RPM
		Vert. 17"	16"	16—¼" to 16"	75"		
No. 2 Model CH Plain, Universal and (sliding head) Vertical	50" x 12"	Long. 28" Cross 10"	28" 12"	16—¼" to 32"	150"—plain & vert. 100"—universal	50	16 — 25 to 1500 RPM
		Vert. 18"	15"*	16—⅛" to 16"	75"—plain & vert. 50"—universal		

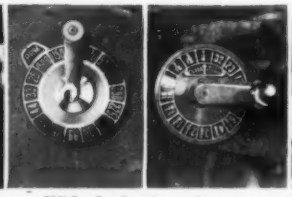
*Add 4" vertical travel for sliding head

TYPE MACHINES

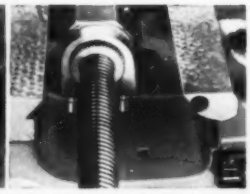
3 and 5 Horsepower

New Kearney & Trecker No. 1 CH, No. 2 CHL and No. 2 CH Milling Machines (Plain Universal and Vertical Styles) have every performance-proven operating and construction feature needed for modern short-run or production milling requirements

Positive locking, rapid-set dials are vapor blasted, for high visibility — avoid costly setting errors.

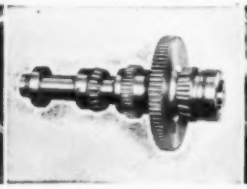


Wider feed and speed ranges meet modern cutting tool requirements — optional ranges available.

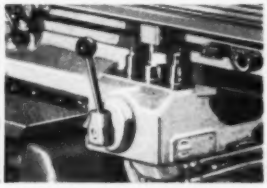


Extra large dia. table feed screw and extra long bronze nut with backlash eliminator gives better climb milling performance.

Positive metered pressure lubrication to saddle, table and knee ways and table feed assembly assure greater machine life.



3-bearing spindle design provides solid support for greater rigidity and cutting efficiency using modern cutting tools.



Mono-Lever and Automatic Cycle Table Control (optional) provides high speed production on long or short runs — cuts operator fatigue.

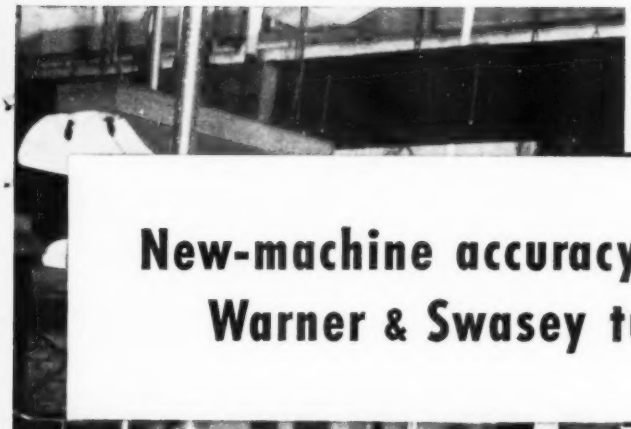
New, heavier columns are scientifically designed to absorb vibration from heavy cutting loads... give greater overall rigidity.

If you're looking forward to modernizing your tool-room or milling machine line — you can't afford to overlook these new 3 and 5hp knee types. They offer you wider working ranges, more practical operating features and heavier construction than any comparable equipment. They've been designed to fully answer today's milling needs — and tomorrow's as well. For complete data on these machines, contact your Kearney & Trecker representative or write direct. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

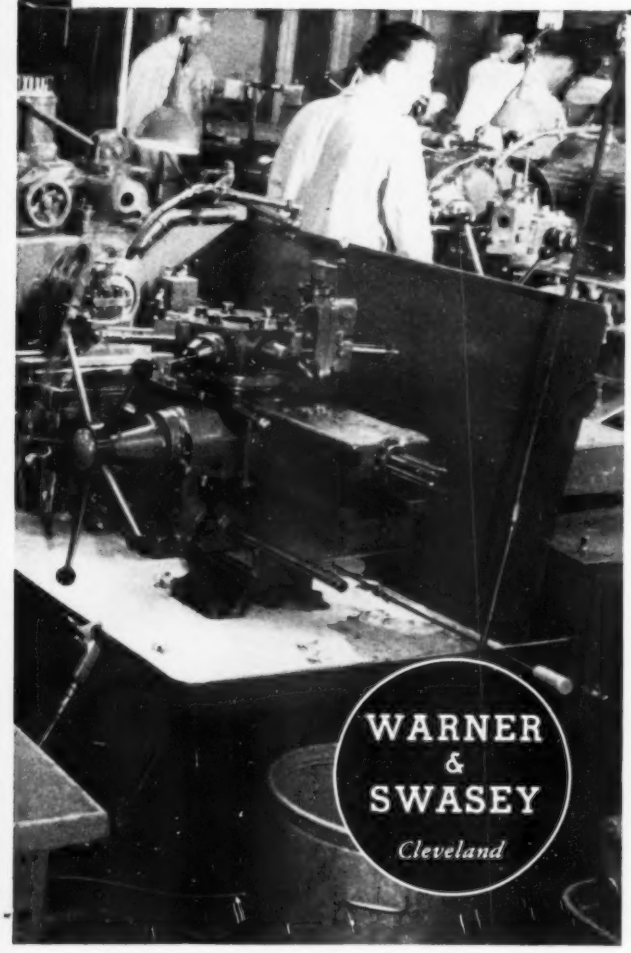
KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Warner & Swasey Turret Lathes at Reeves Instrument Corporation, New York City

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER



New-machine accuracy from war-built Warner & Swasey turret lathes!



This story comes from the REEVES INSTRUMENT CORPORATION of New York City, a company manufacturing precision computers and instruments. Reeves tells us that they still maintain .0005" accuracy from eight Warner & Swasey No. 3, 4, and 5 Turret Lathes purchased during World War II!

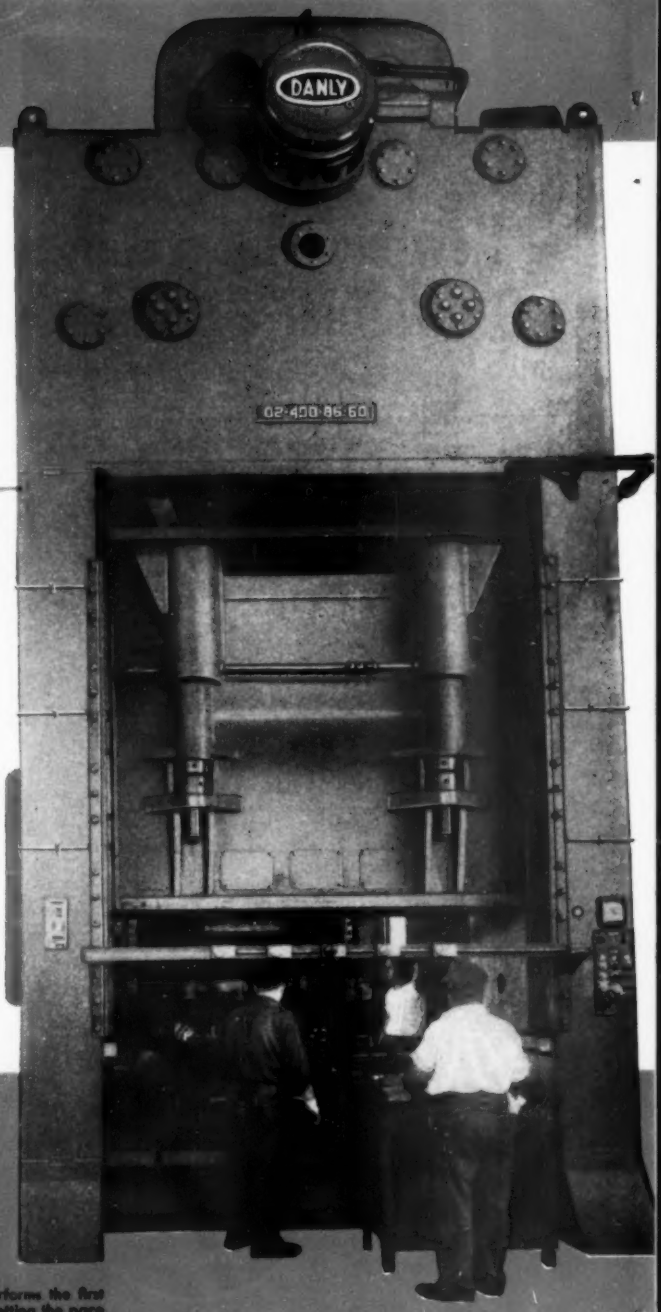
If you will recall the almost unbelievable production of machine tools in those days, it might be quite natural to think there would have been some letdown in the accuracy built into those machines. But Reeves continues to produce vital instrument parts to rigid Air Force and Navy standards of precision on their war-built Warner & Swaseys.

Today, production history is repeating itself. We're turning out machines at a tremendous rate to fill the needs of defense plants and other manufacturers. But there has been—and will be—no letdown in the accuracy and dependability that is built into all Warner & Swaseys.

& SWASEY TURRET LATHES, AUTOMATICS, AND TAPPING MACHINES

DANLY PRESSES

BUILT TO BEAT PRODUCTION RECORDS!



HEADING THE LINE . . .

This 400 ton Danly Double Action Press performs the first drawing operations on a variety of pieces, setting the pace for the entire line. Clear access to the die area speeds die changing.

. . . at the Marion Industries Division of Motor Products Corporation, Marion, Ohio

Ability to meet emergency schedules . . . to keep running day after day under maximum load conditions . . . is built into every Danly Press. Exclusive design features like the Danly Cool-Running Clutch and extra rigid, precise construction throughout assure longer uninterrupted production runs—less down time for routine maintenance.

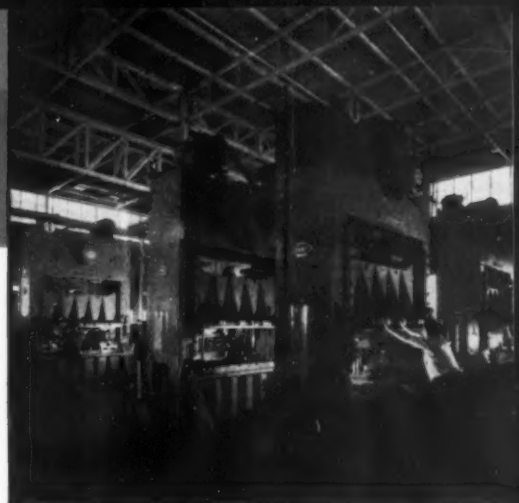
That's why you find more and more *complete lines* of Danly Presses in leading stamping plants like this. Smoother, quieter and easier to operate, Danly Presses are preferred by press room personnel too!

Call a Danly Engineer today and see how Danly Presses, engineered to meet your specific requirements, will make your press room more efficient.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

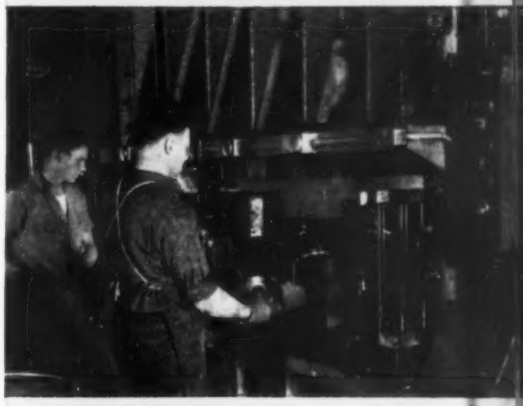
Mechanical Presses . . . 50 to 3000 tons

Straight Side | Autofeed | Gap Frame | Double Action | Underdrive



PRODUCTION FLOW . . .

where a sequence of stamping operations is performed continuously on a line, each press is vitally important. Every press in the two lines shown here is a Danly.

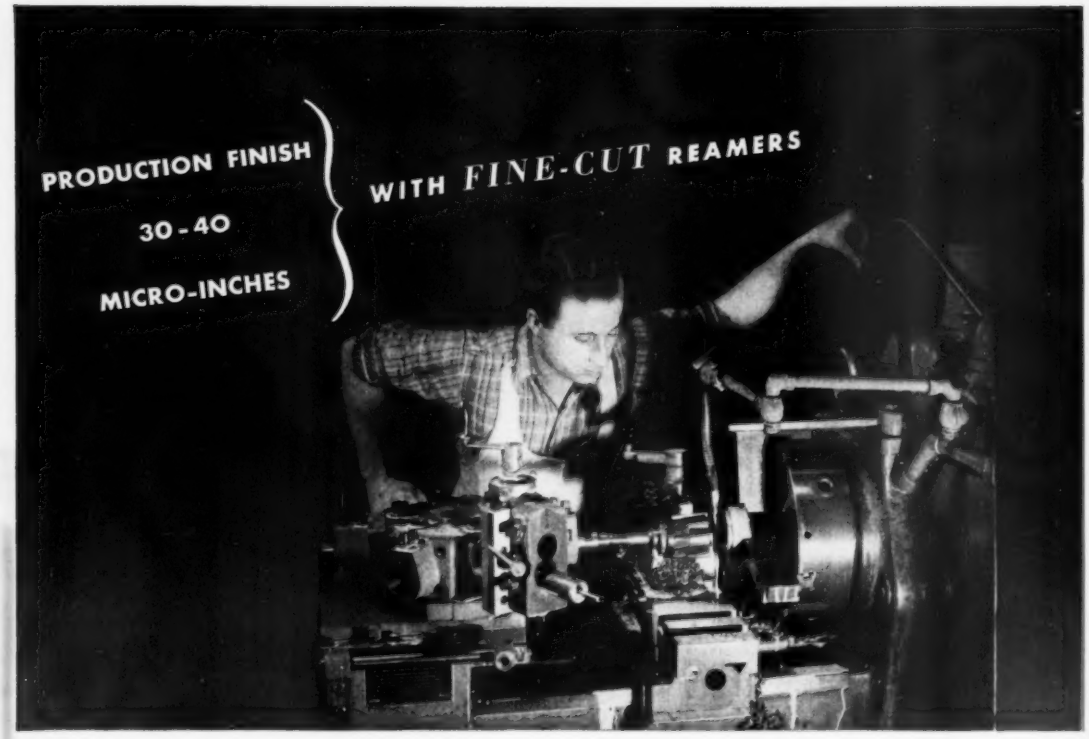


EXTRA SAFETY . . .

Danly Press Controls protect operators and equipment too. Here, two operators independently feed separate dies in the same press with maximum safety. In this setup, it is required that each operator engage two run buttons during most of the down stroke before the press will complete the cycle.

DANLY

IT COSTS LESS TO RUN A DANLY PRESS

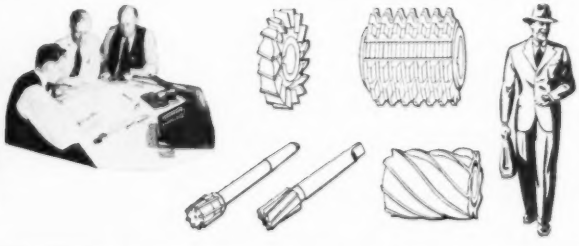


You can ream finishes like this in *regular production* operations with Barber-Colman Fine-Cut Reamers. Many jobs which previously required finishing by lapping or honing are now being finish reamed with these Fine-Cut reamers. All elements for fine finish, accuracy and tool life are provided in the reamer design and application of Barber-Colman job-engineered reamer sharpening.

With assurance of this built-in control, more pieces can be finish-reamed before breaking the set-up for re-sharpening. In addition, the Barber-Colman blade mounting design combines outstanding tool life with ease of blade adjustment and absolute rigidity. That's why you outproduce — and outearn — conventional tool designs every time with Barber-Colman reamers.

A Complete CUTTER ENGINEERING SERVICE *to Solve Your Metal-Cutting Problems*

BARBER COLMAN ®



JOB-ENGINEERED DESIGN • FULL LINE OF STANDARD TOOLS • FIELD SERVICE

Barber-Colman

FINE-CUT REAMERS

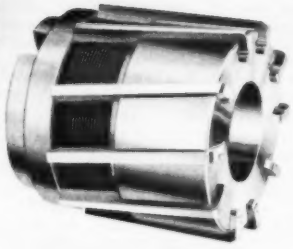
ONE-CUT FINISH REAM 30-40 MICRO-INCH FINISH, CUTTING 170 FEET PER MINUTE, USING .008" — .010" FEED

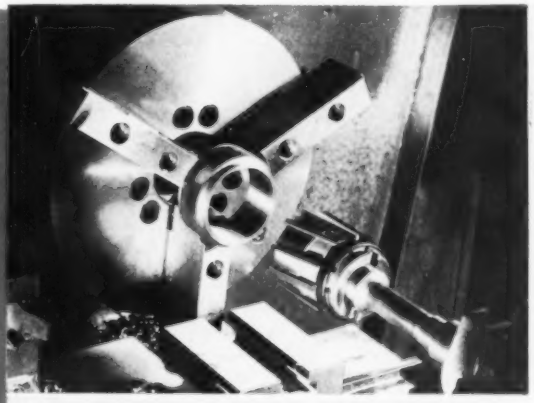
No special tooling is required to get results like these. A standard turret-lathe set-up is used. The large number of blades in the reamers provides extra stability in the cut and smaller chip load per tooth, resulting in a very fine finish.

Front chamfer, secondary lead and back taper are specified for these particular job conditions by Barber-Colman Reamer Engineers to produce free-cutting and easy chip removal without scratching, back scoring or gouging.

If you are now choosing between accurate, quality-finish reamed holes — and low-cost production and reamer maintenance — you can have both, using Barber-Colman adjustable reamers. More blades per cutting diameter — blades solidly held in cutting position — Barber-Colman standard irregular blade spacing — these features produce tool room quality under production reaming conditions.

Send specifications on hole sizing and finishing problems to Barber-Colman engineers. They will furnish reamers to give you the desired quality consistently.





1. Reamer, held in turret lathe float, is fed to work revolving at 170 feet per minute, using .008"-.010" feed. Three thousandths stock is removed in a cut 2.88" diameter and 1-1/2" long.

2. Irregular spacing of ten reamer blades is arranged so that diameter size is easily checked across any two blades. Wedge mounting at bottom of blades permits more blades per reamer diameter — hence, finer finish.

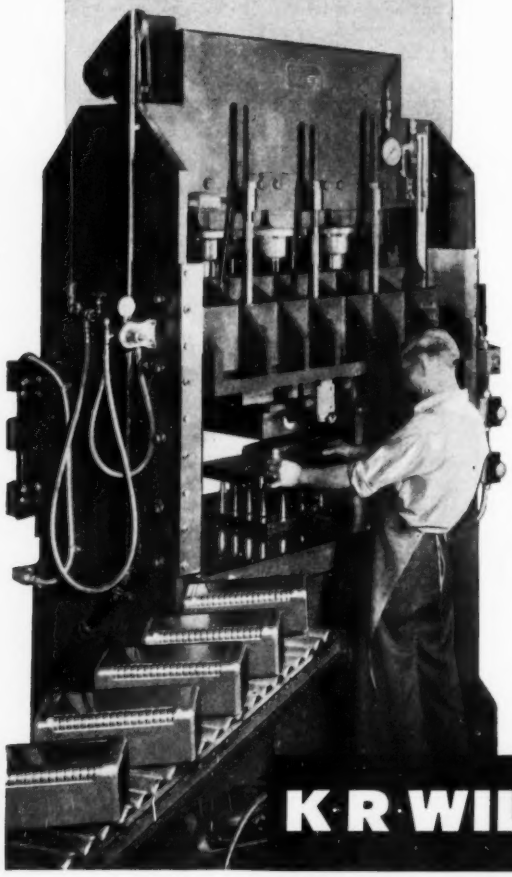
3. Consistent 30-40 micro-inch finish is obtained on these precision boring head collars throughout the life of the reamer because of Barber-Colman job-engineered reamer sharpening.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 519 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

MEET THE KRW PRESS

that armed 681,549 World War II "soldiers"



Millions of "home front soldiers" won a brave battle for America during the war. Not in the field, but on production lines; not with guns, but with tool boxes! And more than 600,000 of them were equipped with tool boxes from Master Metal Products of Buffalo, N. Y. This is one of the KRW 125-ton Hydraulic presses that did the job. Master Metal tells us they're still going strong!

Talk about versatility and rugged service! You get both in a KRW Hydraulic press. They come in one, two or three cylinder models; either hand operated, air operated or motor driven; 25 to 150 ton capacities. KRW hydraulic presses are self-contained above ground. And they'll do much of the work formerly reserved for heavier, costlier equipment . . . at far less cost.

Need hydraulic presses in your business? KRW can give you immediate delivery. If you need a special press to do a special job, we'll build it for you fast!

KRW hydraulic presses enabled Master Metal Products to eliminate several forming operations and at the same time produce one of the strongest seamless drawn industrial tool boxes on the market. Incidentally, Master Metal is the world's largest manufacturer of sanitary waste receivers. Their famous Sanette receivers are also produced on KRW presses.

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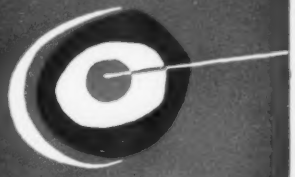

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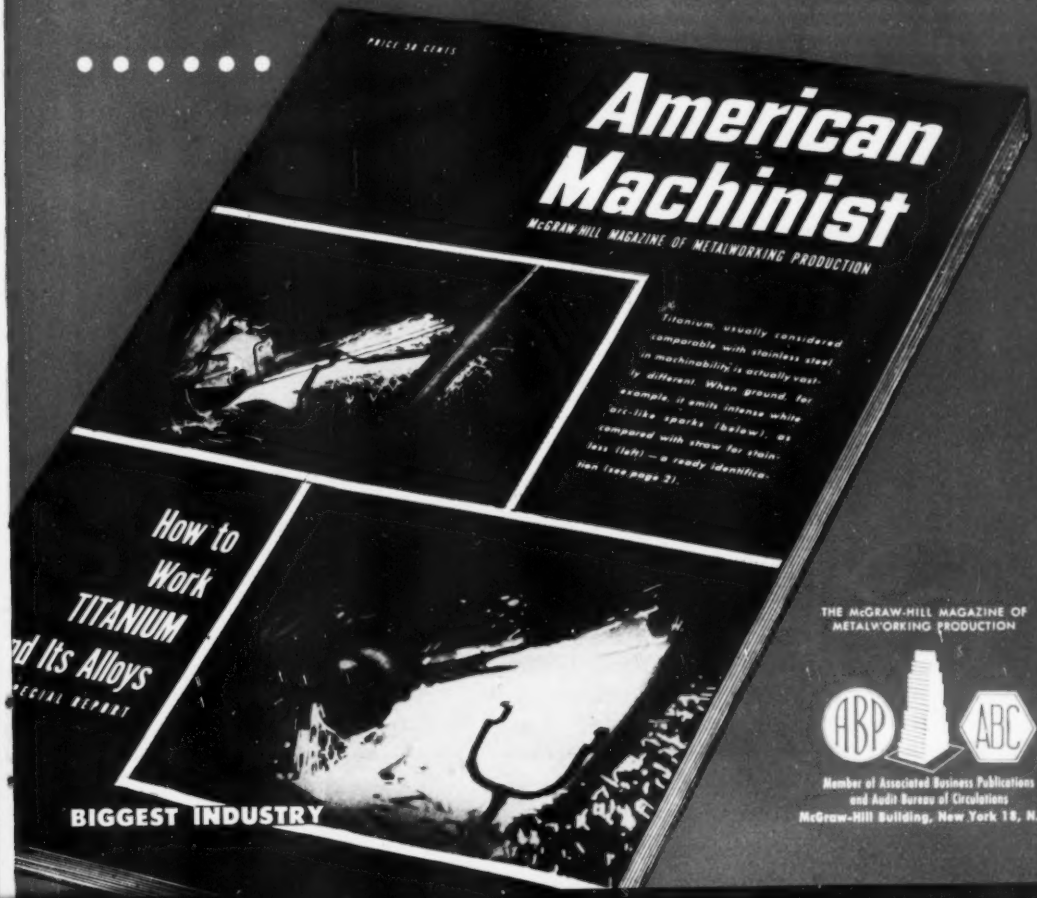
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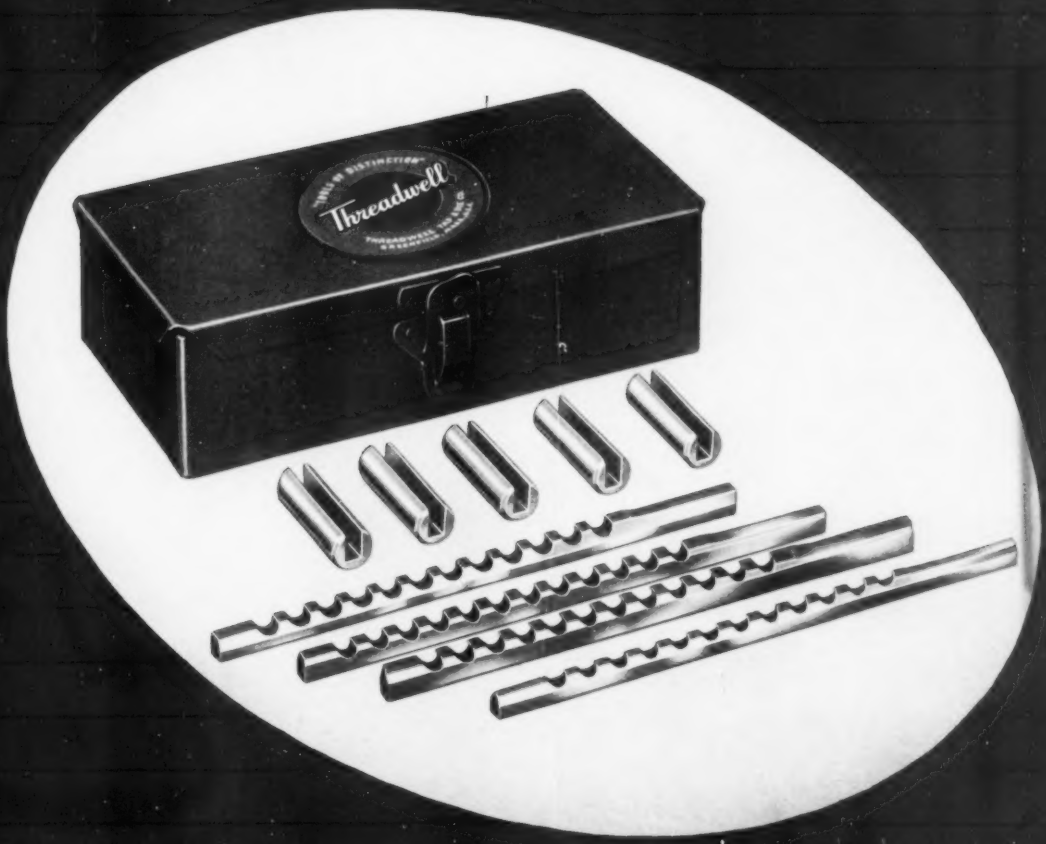
KEYWAY BROACHES & SETS



THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

Table for finding TOTAL KEYWAY DEPTH

SIZE OF SHAFT	1/8 Keyway	3/16 Keyway	1/4 Keyway	5/16 Keyway	3/8 Keyway	7/16 Keyway	1/2 Keyway	9/16 Keyway	5/8 Keyway	11/16 Keyway	3/4 Keyway	13/16 Keyway	7/8 Keyway	15/16 Keyway	1 Keyway
3/8	.0108	.0231	.0478												
7/16	.0091	.0211	.0398	.0656											
1/2	.0079	.0183	.0325	.055	.0815										
9/16	.0071	.0161	.0289	.0473	.0717										
5/8	.0064	.0144	.0254	.0413	.0625	.0894									
11/16	.0058	.0131	.0236	.0379	.0563	.0776									
3/4	.0053	.0121	.022	.0346	.0511	.0705	.0954								
13/16	.0049	.011	.0198	.0314	.0465	.064	.086								
7/8	.0045	.0102	.0177	.0283	.042	.0583	.0765	.1024							
15/16	.0042	.0092	.0164	.0264	.0392	.0544	.0724	.0939							
1	.004	.0089	.0152	.0246	.0365	.0506	.067	.0866	.1097						
1 1/16	.0037	.0084	.0143	.0228	.0342	.0476	.0625	.0807	.1017						
1 1/8	.0035	.0079	.0136	.021	.0319	.0446	.0581	.0754	.0948	.1173					
1 3/16	.0033	.0077	.0131	.0204	.0304	.0421	.0551	.071	.089	.1096					
1 1/4	.0031	.0071	.0127	.0198	.029	.0397	.0522	.0669	.0838	.1032	.1251				
1 5/16	.003	.0068	.0123	.0191	.0279	.038	.0499	.0633	.0792	.0972	.1175				
1 3/8	.0029	.0065	.012	.0185	.0268	.0364	.0477	.0602	.0752	.0922	.1113	.1329			
1 7/16	.0028	.0062	.0114	.0174	.0254	.0346	.0453	.0573	.0715	.0875	.1056	.1258			
1 1/2	.0027	.0059	.011	.0164	.024	.0328	.0429	.0548	.0682	.0835	.1005	.1196	.1409		
1 9/16	.0026	.0057	.0107	.0158	.0231	.0309	.0412	.0524	.0653	.0798	.0956	.114	.1341		
1 5/8	.0025	.0053	.0105	.0153	.0221	.0291	.0395	.0503	.0625	.0754	.0927	.1089	.1279	.1489	
1 11/16	.0024	.0052	.0102	.0147	.0218	.0282	.0383	.0483	.0601	.0733	.088	.1043	.1223	.1422	
1 3/4	.0023	.0051	.0099	.0142	.0201	.0274	.0371	.0468	.0587	.0704	.0844	.1001	.1173	.1368	.157
1 13/16	.0022	.005	.0095	.0136	.0198	.0265	.0355	.0448	.0556	.0678	.0812	.0962	.1126	.1307	.1504
1 7/8	.0021	.0048	.0093	.013	.019	.0257	.0339	.0433	.0536	.0654	.0783	.0927	.1084	.1256	.1446
1 15/16	.002	.0046	.009	.0127	.0184	.025	.0328	.0418	.0518	.0631	.0755	.0893	.1035	.1197	.1391
2	.002	.0044	.0088	.0124	.0179	.0243	.0317	.0404	.0502	.061	.0731	.0863	.1007	.1167	.134
2 1/16	.0019	.0043	.0083	.0117	.0173	.0236	.0308	.0391	.0485	.059	.0706	.0834	.0974	.1127	.1293
2 1/8	.0018	.0042	.0078	.0115	.0168	.0229	.0299	.0379	.0465	.0572	.0684	.081	.0943	.1091	.125
2 3/16	.0018	.0041	.0073	.0109	.0163	.0222	.0291	.0368	.0455	.0555	.0667	.0783	.0914	.1055	.1214
2 1/4	.0017	.004	.007	.0107	.0159	.0216	.0282	.0358	.0442	.054	.0644	.076	.0886	.1023	.1173
2 5/16	.0017	.0039	.0068	.0104	.0155	.0209	.0274	.0346	.0431	.0523	.0626	.0737	.086	.0993	.1136
2 3/8	.0016	.0037	.0066	.0102	.0152	.0202	.0267	.0338	.0419	.0509	.0609	.0717	.0836	.0965	.1104
2 7/16	.0016	.0036	.0064	.01	.0149	.0198	.026	.0329	.0408	.0495	.0592	.069	.0813	.0942	.1073
2 1/2	.0016	.0035	.0063	.0098	.0146	.0194	.0253	.032	.0398	.0483	.0577	.0679	.0792	.0911	.1044
2 9/16	.0015	.0034	.0061	.0094	.0142	.0189	.0247	.0313	.0387	.047	.0561	.0661	.0771	.0889	.1016
2 5/8	.0015	.0033	.006	.009	.0139	.0185	.0242	.0305	.0378	.0459	.0548	.0645	.0751	.0867	.0989
2 11/16	.0014	.0032	.0059	.0089	.0136	.018	.0236	.0293	.037	.0447	.0531	.0629	.0733	.0845	.0968
2 3/4	.0014	.0031	.0058	.0088	.0133	.0176	.023	.0289	.036	.0437	.0521	.0614	.0715	.0824	.0941
2 13/16	.0014	.0031	.0057	.0086	.0129	.0172	.0226	.0285	.0352	.0427	.051	.06	.0699	.0804	.092
2 7/8	.0013	.003	.0056	.0084	.0126	.0168	.022	.0278	.0344	.0417	.0498	.0587	.0682	.0786	.0898
2 15/16	.0013	.003	.0054	.0083	.0122	.0164	.0216	.0273	.0336	.0408	.0487	.0573	.067	.0769	.0877
3	.0013	.0029	.0053	.0081	.0119	.0161	.0211	.0266	.0329	.04	.0477	.0561	.0652	.0752	.0858
3 1/16		.0029	.0052	.008	.0116	.0158	.0207	.0261	.0322	.0391	.0466	.0549	.0639	.0735	.0841
3 1/8		.0028	.0051	.0078	.0114	.0155	.0202	.0256	.0316	.0382	.0455	.0538	.0625	.0721	.0821
3 3/16			.005	.0076	.0112	.0152	.0198	.0251	.031	.0375	.0447	.0526	.0613	.0705	.0805
3 1/4			.0049	.0075	.011	.0149	.0194	.0246	.0304	.0369	.0439	.0517	.06	.0691	.0789
3 5/16			.0048	.0074	.0108	.0146	.0191	.0241	.0298	.0362	.043	.0506	.0589	.0677	.0773
3 3/8			.0047	.0072	.0106	.0143	.0187	.0237	.0292	.0354	.0421	.0497	.0578	.0664	.0752
3 7/16			.0046	.0071	.0104	.014	.0184	.0232	.0287	.0348	.0414	.0487	.0567	.0651	.0744
3 1/2			.0045	.007	.0102	.0138	.018	.0228	.0282	.0342	.0406	.0478	.0555	.064	.073
3 9/16			.0044	.0069	.0101	.0135	.0178	.0224	.0277	.0335	.04	.047	.0546	.0628	.0716
3 5/8			.0043	.0067	.01	.0133	.0174	.022	.0269	.0329	.0392	.0461	.0536	.0618	.0704
3 11/16			.0042	.0066	.0099	.0131	.0171	.0216	.0266	.0324	.0386	.0454	.0528	.0607	.0691
3 3/4			.0042	.0065	.0098	.0128	.0168	.0213	.0263	.0318	.038	.0447	.0519	.0596	.0679
3 13/16			.0041	.0064	.0097	.0126	.0166	.0209	.0258	.0313	.0379	.0438	.0509	.0584	.0667
3 7/8			.0041	.0063	.0096	.0124	.0163	.0206	.0254	.0308	.0367	.0431	.05	.0576	.0656
3 15/16			.0041	.0062	.0095	.0123	.0161	.0202	.025	.0302	.0361	.0424	.0492	.0566	.0645
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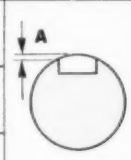

In the column marked "Size of Shaft" find the number representing the size; then to the right find the column representing the keyway to be cut and the decimal there is the distance "A" which added to the depth of the keyway will give the total depth from the point where the cutter first begins to cut.

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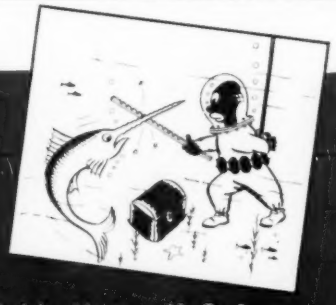
Threadwell Tools do many jobs



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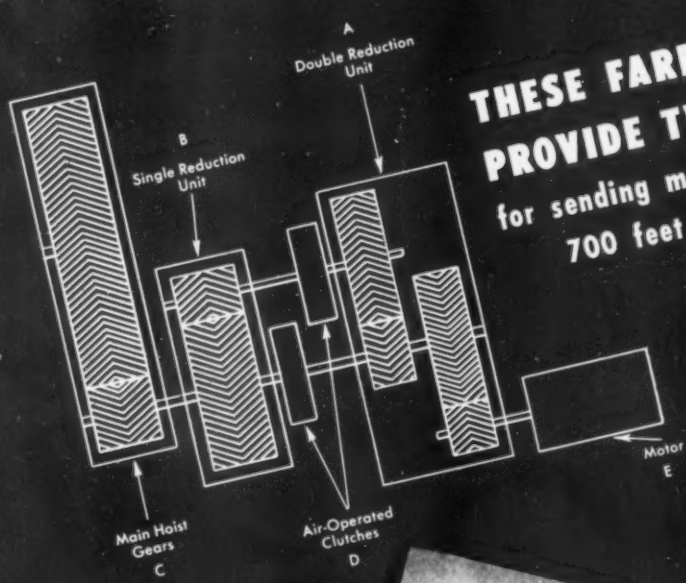
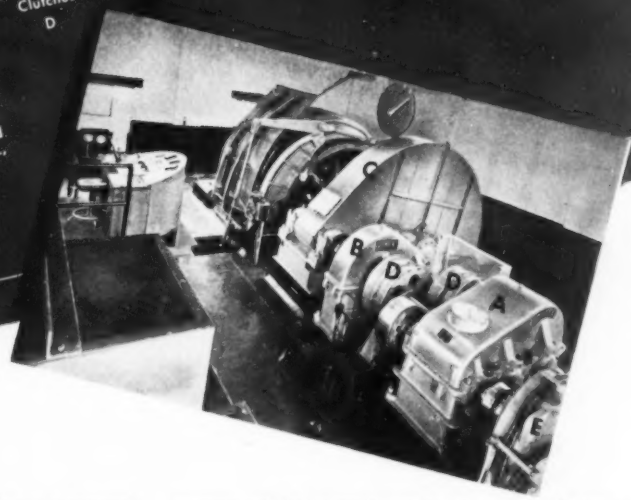


Schematic diagram of the Farrel gear drive for the new hoist at Mine 17 of Peabody Coal Company. The hoist was engineered and manufactured by Robert Holmes and Brothers, Inc., of Danville, Ill.



By actuating one or the other of two air-operated clutches, this mine hoist can be run at either of two speeds. For handling machinery at the lower speed, all of the Farrel gears are used to provide a total speed reduction of 144 to 1. For carrying men, the higher hoist speed is used by cutting out the single reduction unit and the second pair of gears of the double reduction unit, giving a speed ratio of 49 to 1.

Farrel-Sykes herringbone gears were selected for this installation because of their quiet, vibration-free performance and long-life dependability — qualities which result from extreme accuracy of tooth spacing, contour and helix angle, and other features inherent in the Farrel-Sykes method of gear generation. These gears are available in any size from ¼ inch to 20 feet diameter, for any application.

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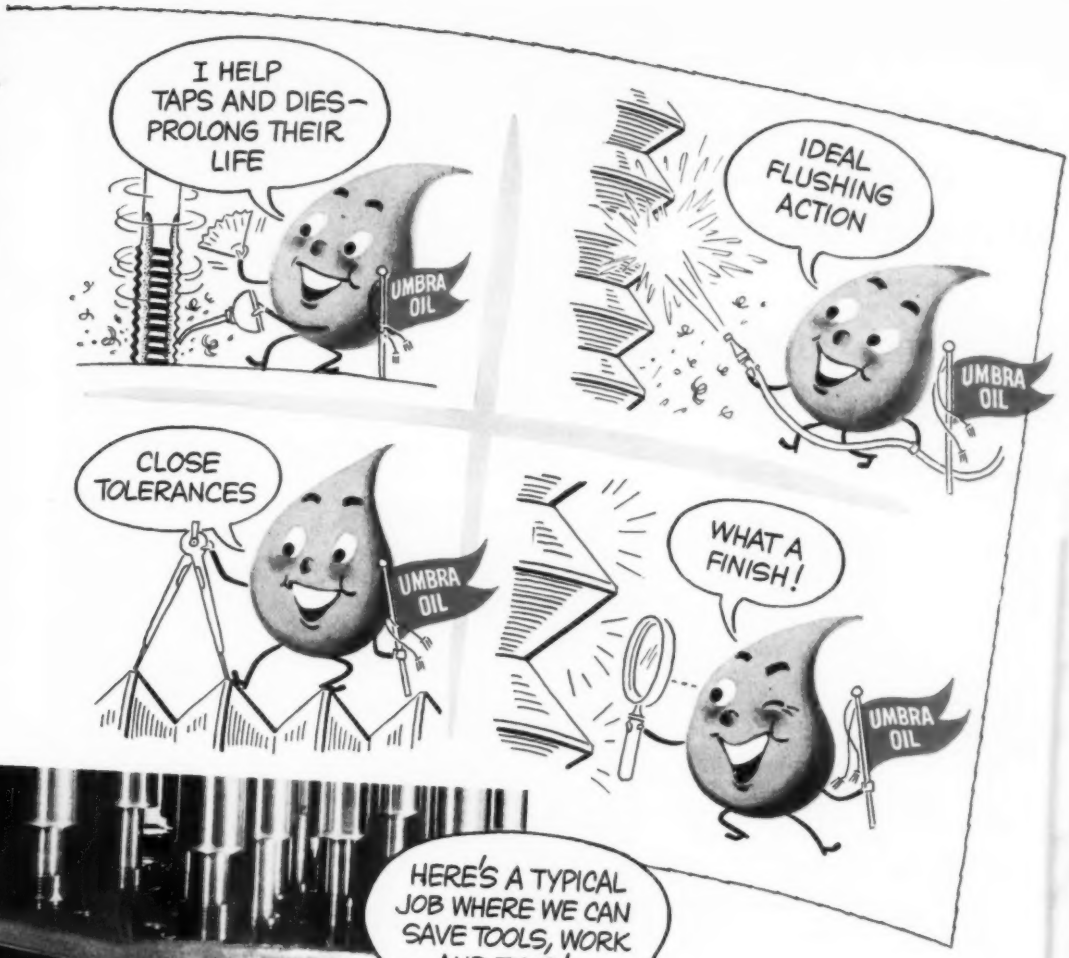
Taps of the Threadwell Tap & Die Company in action on a Hartford Special Drilling and Tapping Machine.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Capillarity, the ability to absorb liquid, is one property of abrasives which largely determines a polishing wheel's strength and resistance to breakdown. When abrasive grain has high capillarity it is held more firmly by the glue on the wheel head — sticks on the wheel until *all* its work is done.

Norton ALUNDUM abrasive is specially treated to raise its capillarity — and to retain this valuable quality — assuring longer lasting, more efficient polishing wheels.

Offering many other advantages for fast, clean polishing, ALUNDUM abrasive grain is available in sizes and with surface treatments for best results on every polishing job. Write for Booklet No. 1340, "*Setting Up Polishing Wheels And Belts*," containing many helpful tips. Norton Company, Worcester 6, Mass. Distributors in all principal cities.

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LOW CAPILLARITY is shown by the way this abrasive grain sheds water. It will repel glue in the same degree, resulting in insecure adhesion of abrasive to wheel head — and short wheel life.

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3. Minimizes Warpage

Because it is *stress-relieved*, this superior bar assures the user a minimum of distortion.

4. Speeds Up Machining

Has *in-the-bar* machinability fully 50% better than heat-treated alloys of the same hardness.

Many companies are realizing important savings by using Ground and Polished STRESSPROOF bars instead of grinding the steel in their own shop. For this superior steel provides precision tolerances at a reasonable cost, without tying up valuable labor and machinery.

This all-purpose bar stock is ground to close tolerance and highly polished at the LaSalle plant on batteries of modern machines — at lower cost than you can grind it yourself. Furthermore, because this versatile steel is stress-relieved, it requires no straightening after keyseating, journaling, threading, or other machining operations. And its four qualities in-the-bar eliminate many other costly operations.

Almost all of today's Ground and Polished STRESSPROOF production is going into defense jobs. However, from time to time, some sizes of sample bars may be available for testing purposes.

LaSalle STEEL CO.

1416 150th Street, Hammond, Indiana

Manufacturer of the Most Complete Line of Carbon and Alloy Cold-Finished and Ground and Polished Bars in America.

HOW TO GET THE MOST OUT OF THE

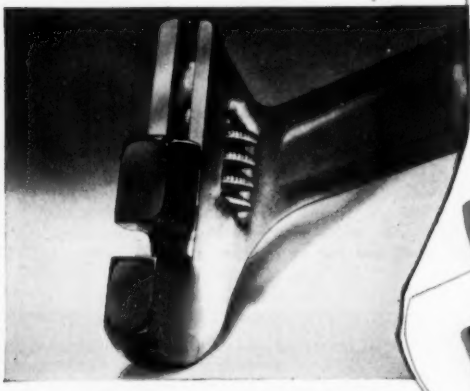
"lean alloys do the job when we use U·S·S Improved Heat Treatment*"

says **C. E. WILDERMAN,**
Vice President, Tool Division, Utica Drop Forge & Tool Corp., Utica, N. Y.

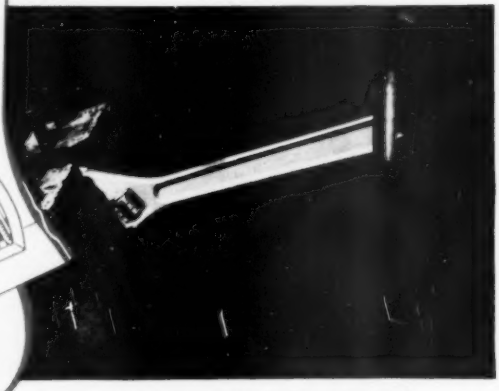
*available without charge

". . . lean alloys forge easier than high alloys, so we get longer die life."

". . . drilling and machining operations are simplified."



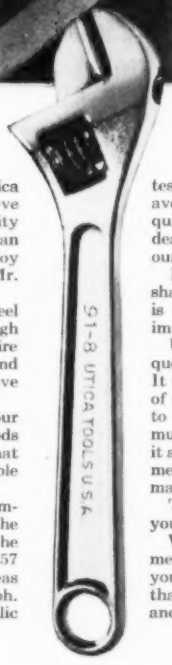
". . . working faces are easily induction hardened." Notice dark sections on jaw faces.



". . . torque tests average 25,000 in. lbs. against 7,650 in. lbs. required by Federal Specifications."

LEAN ALLOY STEEL YOU'RE GETTING

U·S·S Improved Heat Treatment is an improved method of quenching and tempering by means of violent agitation of the quenching bath. The basic engineering principles involve quench tank design, and the definite size, number, placement and powering of the propellers.



BY USING U·S·S IMPROVED HEAT TREATMENT, the Utica Drop Forge & Tool Corp. find they easily achieve the great strength demanded in their high quality adjustable-end wrenches with a medium carbon lean alloy grade of Carilloy steel. The use of a lean alloy in turn means several extra advantages. But let Mr. Wilderman tell the story:

"We have 3 big reasons for using a lean alloy steel for our wrenches. 1) It forges easier than the high alloys, so we get longer die life, 2) Lean alloys require shorter annealing cycles and 3) Our drilling and machining operations are simplified and we have lower perishable tool cost.

"Using U·S·S Improved Heat Treatment, our metallurgists have developed heat treating methods that enable us to get results with lean alloys that are equal to or even better than those obtainable with the high alloys.

"In our operation, the wrench is hardened and tempered to a uniform 44/46 Rockwell "C" scale with the aid of U·S·S Improved Heat Treatment. Then the working faces are easily induction-hardened to 55/57 Rockwell "C" scale. The induction-hardened areas are shown by the dark sections on the photograph.

"Daily control tests conducted on the hydraulic testing machine shows results (for the 12" wrench) averaging 25,000 in. lbs. against 7,650 in. lbs. required by Federal Specifications. We think a good deal of the credit for these torque ratings is due to our U·S·S Improved Heat Treatment."

If you are having heat treating difficulties, keep a sharp eye on *quenching* methods. Proper quenching is often just as important—sometimes even more important than the steel or the heating.

U·S·S Improved Heat Treatment is a superior quenching method developed by United States Steel. It removes heat quickly and evenly from every part of the material's surface. Elapsed time from quench to tempering treatment is held to an absolute minimum. This not only improves mechanical properties; it also reduces cracking. Furthermore, this quenching method improves machineability by minimizing formation of free ferrite in hypo-eutectoid steels.

The use of this quenching process is available to you without charge.

We do not manufacture or sell heat treating equipment, but our metallurgists will be glad to analyze your heat treating methods and make suggestions that may give you more uniform hardness, less rejects and less re-treatments.

UNITED STATES STEEL COMPANY, PITTSBURGH • COLUMBIA STEEL COMPANY, SAN FRANCISCO • TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM

UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

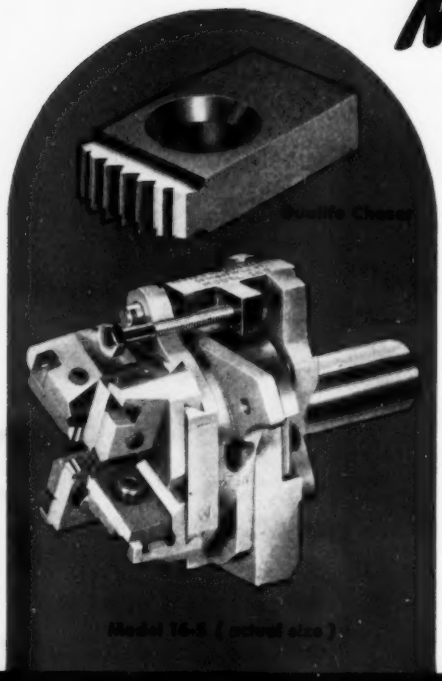
Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH • COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

1-1127

UNITED STATES STEEL

NEW Nos. 16-S, 18-S, and 19-S Jones & Lamson Die Heads

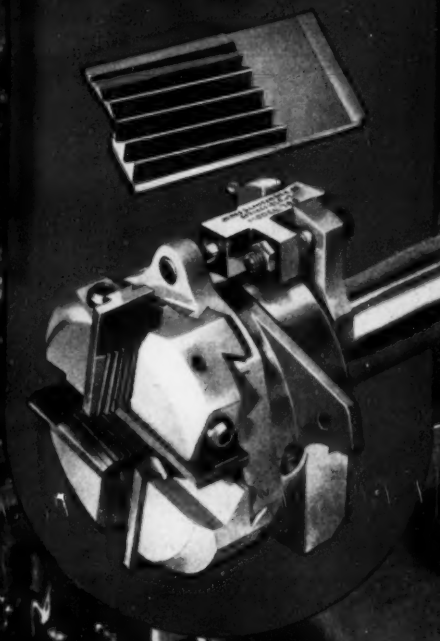


Designed and built for high production quality threading, these new J&L dies perform with smooth, easy action, unusual repetitive accuracy, and year 'round dependability at low cost. They will give you maximum productive machine hours each day.

No. 16-S is for use on No. 00 and 00G and No. 0 and 0G Brown & Sharpe Automatics and small turret lathes. It uses long wearing ground thread, radial type chasers *with two cutting edges.* These DUALIFE chasers are easily and quickly removed and replaced in their holders. When one edge wears out, just turn them over, and you have the equivalent of a new set of chasers. Minimum down time and maximum production result.

No. 18-S and 19-S Model 18-S is for use on No. 0, 0G and No. 2, 2G Brown & Sharpe Automatics. Model No. 19-S with wider capacity range, is for use on No. 2, 2G Brown & Sharpe machines. Both are also used on small turret lathes. They have Tangent type chasers, ground all over, incorporating the exact helix angle and thread form. They are easily removed and replaced without disturbing the head and holder assembly. Many of these chasers are interchangeable between the two models and other standard J & L Tangent Die Heads. Carbide chasers can be used when conditions permit.

for Brown & Sharpe Automatics and Small Turret Lathe Applications



★ Simple, compact design combines light weight with strength, to function dependably and accurately at high indexing speeds, with long runs between grinds.

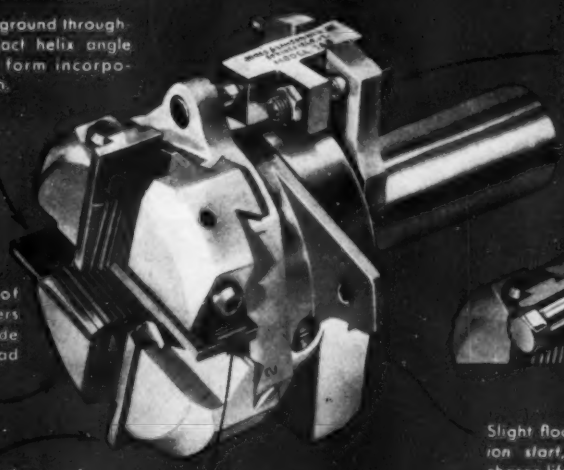
★ All important bearing surfaces are hardened and ground and hand lapped.

★ All external surfaces are chrome plated for protection.

Chasers are ground through out; with exact helix angle and thread form incorporated in each.

One set of chaser holders handles a wide range of thread sizes.

Leading edge of chasers extends beyond face to permit threading close to shoulders.



Chasers can be changed and set quickly, easily and accurately. A few turns of a *single* screw will release or secure each chaser in its holder.

Adjustable Trip, quickly converted for either PULL OFF or EXTERNAL TRIP. Easy, quick opening prolongs both chaser and die life, increases runs between grinds.

Slight float provides cushion start, helps prolong chaser life.

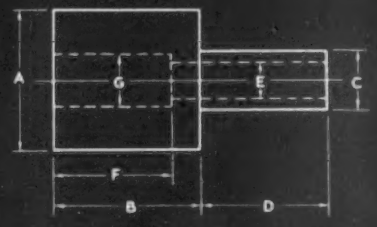
All three models can be furnished with a lever locking handle, for use on small turret lathes.

Specifications for Nos. 16-S, 18-S, 19-S Jones & Lamson Die Heads

DIE NO.	CAPACITY	THREAD	LENGTH
16-S	No. 0 through 3/8" (Coarsest standard Pitch-18 TPI)	No. 0 through 3/8" dia.	Any length
18-S	No. 4 through 9/16" (9/16" holders Coarsest standard Pitch-12 TPI)	On No. 0 & OG B & S machines	
		No. 4 through 7/16" dia.	Any length
		Over 7/16" through 9/16" dia.	Max. length 1-7/8"
		5/8" dia.*	Max. length 1"
		On No. 2 & 2G B & S machines	
		No. 4 through 9/16" dia.	Any length
		5/8" dia.*	Max. length 1-1/8"
19-S	No. 4 through 9/16" (9/16" holders Coarsest standard Pitch-12 TPI)	No. 4 through 9/16" dia.	Any length
	5/8" through 1" (1" holders Coarsest standard Pitch-10 TPI)	5/8" dia.	Any length
		Over 5/8" through 1" dia.	Max. length 2-1/4"
	7/8" through 1-1/4" (1-1/4" holders Coarsest standard Pitch-12 TPI)	7/8" through 1" dia.	Max. length 2-1/4"
		Over 1" through 1-1/4" dia.	Max. length 1/2"

*For special application only

DIE	A	B	C	D	E	F	G
16-S	No. 00-000	5-3/8	1-31/32	2-9/16	1-1/16	19/32	13/16	11/16
	No. 0-00	5-3/8	1-31/32	2-9/16	1-1/16	19/32	13/16	13/16
18-S	No. 0-00	5-3/8	2-7/32	2-9/16	1	19/32	1	29/32
	No. 2	5-3/8	2-17/32	2-9/16	1	19/32	1-1/4	21/32
19-S	No. 2	5-7/8	2-13/16	2-9/16	1	19/32	1-1/4	1-1/16



Write for catalogs describing our complete line of Tangent Dies up to 2" dia. capacity, and Radial Dies up to 4¼" dia. capacity.

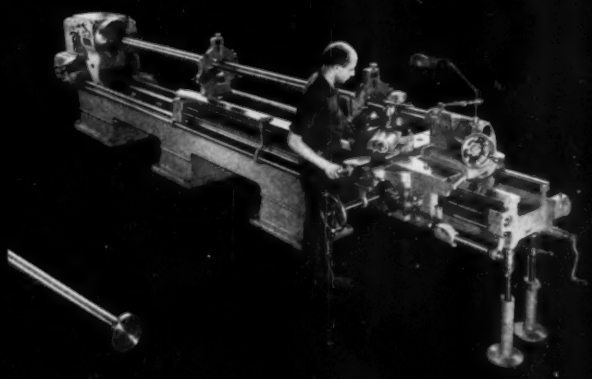
Die Head Division

JONES & LAMSON

MACHINE COMPANY

Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835



giant

Versatility of this new LeBlond 16"/38" Sliding Bed Gap Lathe is demonstrated at Mixing Equipment Co., Inc., Rochester, New York. The irregularly-shaped semi-steel base (below) swings 33", overhangs 18"—depth of cut (intermittent), 3/32"; spindle speed, 86 rpm; feed, .014"; tool, carbide. The 14" AISI 304 stainless steel shaft and coupling (above) are accommodated (without special equipment) by extending the bed—the coupling is turned to limits of .001"; depth of cut, 1/16"; spindle speeds, 166 rpm roughing, 212 rpm finishing; feed, .010"; tool, carbide.

"eggbeaters" ..... for industry

These huge mixers (up to 500 hp) do a big job of "eggbeating" for industry. They're used to blend chemical formulations—to mix pulp for paper—to combine ingredients for thousands of everyday products.

In producing these mixers, Mixing Equipment Co., Inc. of Rochester, New York, has to turn a variety of work . . . from short parts with irregular swings up to 33", to shafts as long as 14'—materials from brass to stainless steel—intermittent cuts to heavy roughing cuts to smooth finishing cuts—tolerances down to .001". All this calls for a rugged precision lathe of unusual versatility. That's why Mixing Equipment Co., Inc. installed a new LeBlond 16"/38" Heavy Duty Sliding Bed Gap Lathe, recommended by LeBlond Distributor, F. W. Schiefer Machinery Company of Rochester.

This multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. It has adjustable gap and center distance, and with bed closed, it operates the same as a standard heavy duty engine lathe. Twenty-four or forty-eight spindle speeds are available, 11 to 673 rpm or 8 to 1010 rpm, respectively—sixty feeds and threads—up to 15 hp. And of course you get all the well-known LeBlond features—hardened and ground steel bed ways, totally-enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

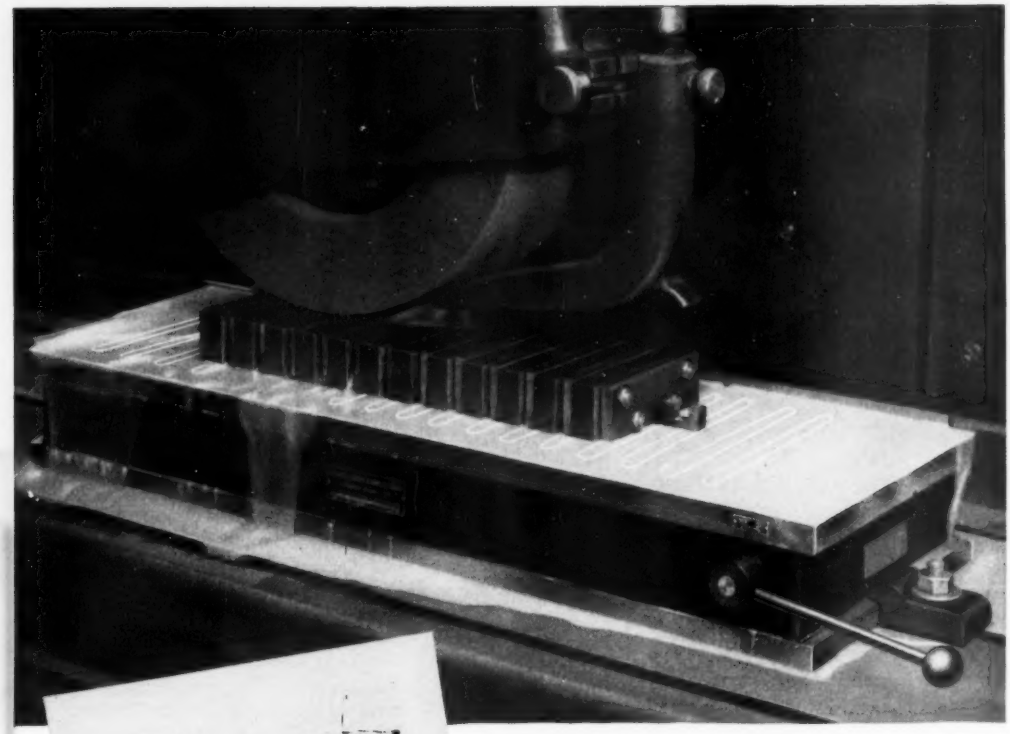
Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them faster, better. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50" and 32"/60". Call him or write—

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

Ask for Bulletin SBG 103 A for complete information on LeBlond Heavy Duty Sliding Bed Gap Lathes.

turned faster by **LeBLOND** *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*



Economical way to save machinists' time

PERMANENT MAGNET CHUCKS

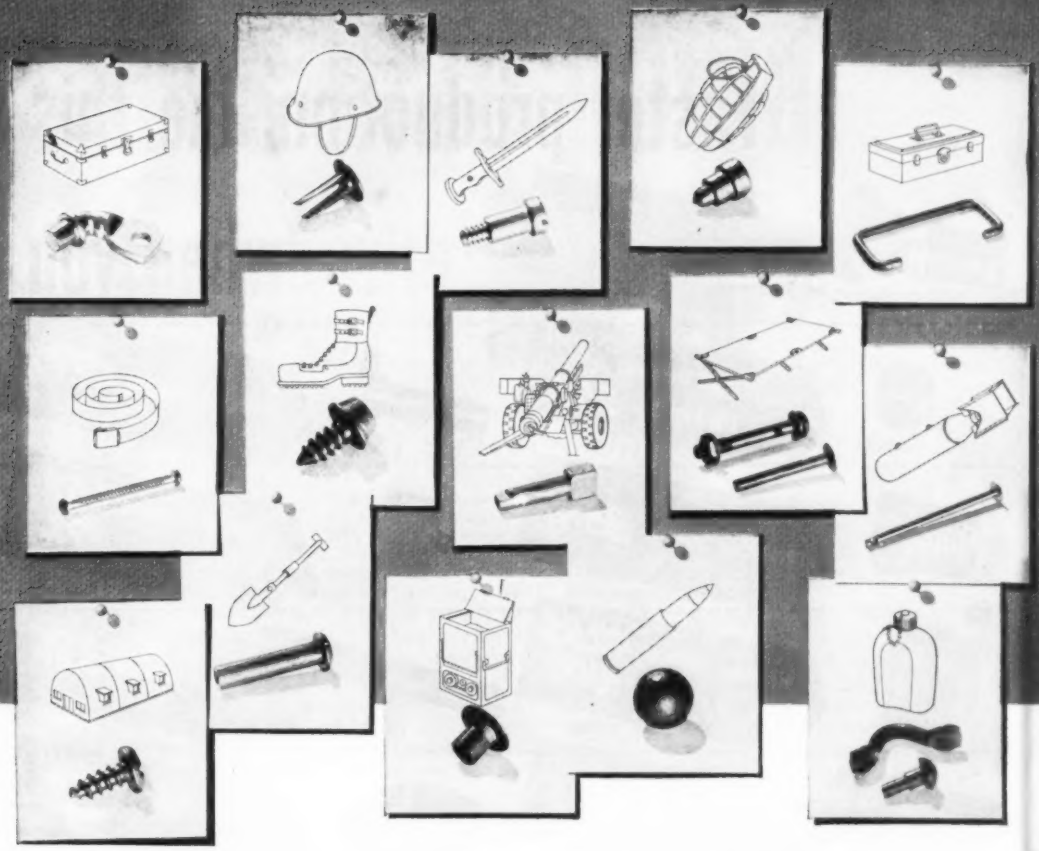
by Brown & Sharpe make the most of a skilled machinist's time — let him do, speedily, many tasks that require extra work by other means.

These economical time-savers are completely portable, have no wires to connect, cost nothing to operate, hold as long as desired without heating, last indefinitely. Permanent Magnet Chucks speed setting up . . . eliminate the need for clamps, vises, jigs or fixtures on many jobs. A quick shift of a lever engages or disengages magnetic holding power.

Complete line includes Rectangular Models for grinding, inspecting, light machining; and Rotary Models for light lathe work, cylindrical and face grinding. Rectangular Models available in 8 sizes from $2\frac{7}{16}$" x $5\frac{1}{4}$" to $12\frac{1}{8}$" x 36"; Rotary Models in 5", 7", and 9" diameters. For sale only in the United States and its territories. Write for catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S



With Townsend Fasteners and Parts you produce defense items with economy and speed

You reduce costs and speed delivery of military items by calling upon Townsend's past experience in producing special fasteners and parts for all types of Army and Navy material.

Townsend has made parts for a multitude of items from rivets for cots and beds to balls for artillery canisters — from hob nails for field boots to rivets for half track treads — from sheet metal screws for Quonset huts to pins and burrs for pup-tent poles— from special nails for gliders to large rivets for tanks— from handles for tool chests to screws for bayonets —to name but a few.

As specialists in cold heading, Townsend has demonstrated to customers everywhere the economy of parts made by the cold-heading process. It is fast, accurate and ideally suited to volume production. It also conserves metal because in this process the metal flows into shape—there are no waste shavings and chips.

As a result, Townsend produces small parts and fasteners at costs far below screw machine prices— and makes them faster. This saving in time and money may give you an advantage in bidding on government contracts. To learn more about the economy of using Townsend products, write or phone today.

Townsend

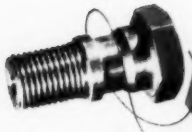
COMPANY • ESTABLISHED 1816

Plants—New Brighton, Pa. • Chicago 38, Ill.

Cherry Rivet Company Division, Los Angeles, California

Sales Offices in Principal Cities

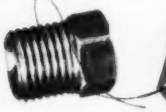
Faster production like this when you



Production Increased 29%

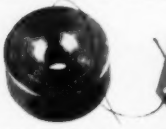
Hourly Output Increased 49%
Tool Life Increased 25%

Production Increased 41.7%



Production Increased 33⅓%

Production Increased 66%
Tool Life Increased 87%

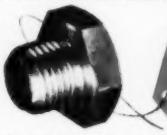


Production Increased 42.5%
Tool Life Increased 100%

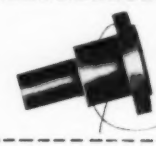
Production Increased 35%

Production Increased 50%

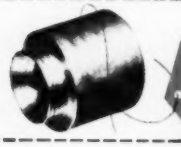
Production Increased 29%
Tool Life Increased 20%



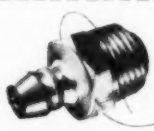
Daily Output Increased 19%
Tool Life Increased 39%



Tool Life Increased 200%



Production Increased 51%



Production Increased 17%
Tool Life Increased 50%

Production Increased 26%
Tool Life Increased Almost 100%

Production Increased 27%

Production Increased 55%
Tool Life Increased 30%

saves man-power...

do the job with MX

today's freer-cutting screw stock!

IN SHOPS where manufacturers of screw machine parts have switched from ordinary Bessemer screw stock to U·S·S Free-Machining MX, output per man, per machine, per hour has increased. The obvious results? Shop efficiency has jumped . . . unit costs have dropped.

The greater machinability of MX permits higher cutting speeds and longer periods between tool grinds. This is especially important today as the man-power pinch becomes increasingly acute.

Your man-shortage troubles are bound to become less pressing when you can increase your output 27%, 50%, or 66%; when your tools last two or three times as long—as on some of the typical MX-produced parts shown here.

Helpful, too, under present conditions is the fact that MX, because of its greater uniformity and better machinability, will permit you to turn out, *rapidly* and to close tolerances, the intricate and precise screw machine products now being called for.

And MX will cut their cost as well.

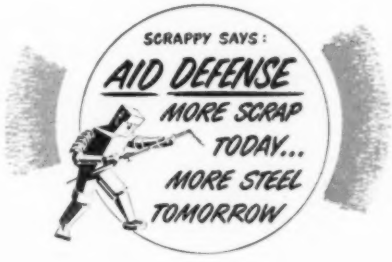
This is proved by the results obtained with MX to date. In producing many millions of parts of many different kinds, cost reductions have run as high as 42%. Usually the figure runs around 10 to 15%—but, without exception, cost savings have been recorded in every instance MX was given a thorough trial. That's why we feel safe in saying that MX will cut the cost of *any* part you now machine from ordinary Bessemer screw stock, even though MX costs a little more.

Give MX a thorough trial. Prove on your own machines that MX will reduce part cost by increasing production; will reduce machine down-time by prolonging tool life; will often eliminate extra finishing operations by assuring better part finish; will minimize rejections by providing closer dimensional accuracy.

U·S·S Free-Machining MX is being produced in all the popular screw stock sections and sizes. It is sold in cold-finished form by your regular supplier as "MX" or under his own identifying trade name. In hot-rolled form MX is available direct through our nearest district sales office.

Now, when production is more important than ever—

speed up the job and do it better with MX



USS

AMERICAN STEEL & WIRE COMPANY, CLEVELAND • COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM • UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

1-1305

UNITED STATES STEEL

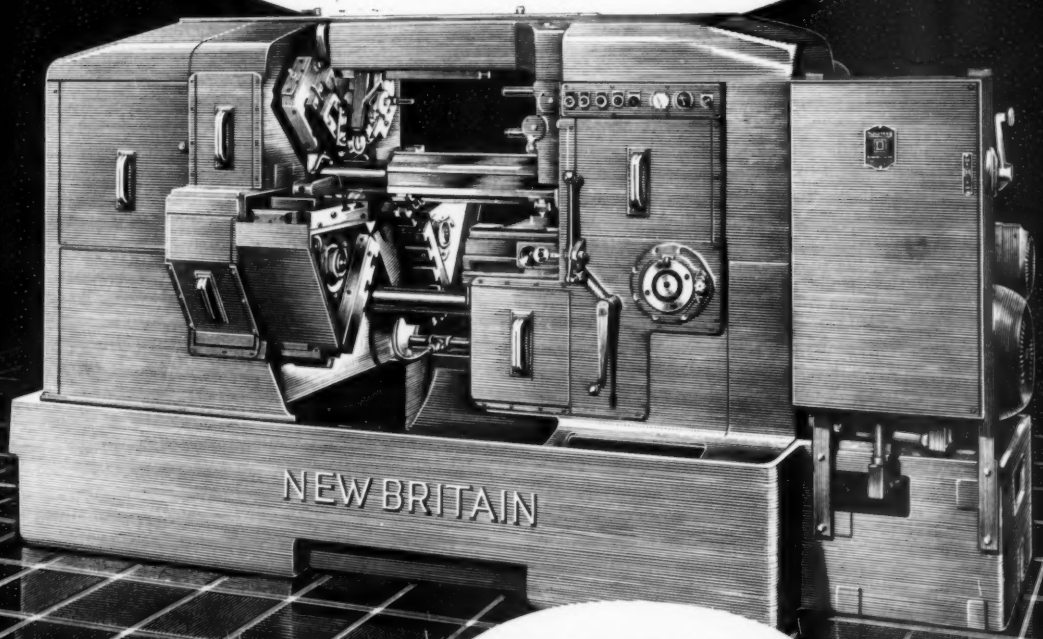
Greater Productivity

. . . More Horsepower . . . Less Man Power

TODAY American Industry is under pressure to meet fantastic demands. Only yesterday, intense competition was the problem. Manufacturers have found the answer to both situations in more productive machine tools. The New Britain-Gridley Division, The New Britain Machine Company, New Britain, Conn., U.S.A.

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES

LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES



NEW BRITAIN
Automatics

RULES TO REMEMBER RE: REAMERS

1 Choose a line that is complete... for all types of applications

2 Be sure there are Field Men available to help you select the right tools and use them right

3 Insist on 100% inspection... each reamer inspected individually

4 Order Butterfield...the reamers that meet all 3 specifications

TESTING HARDNESS of finished tools on a Rockwell Hardness Testing Machine.

Fluted Chucking Reamers
Taper Pin Reamers
Flex-Rite Expansion Reamers • Hand Reamers
Center Reamers and Countersinks
Stub Screw Machine Reamers

See Your Nearby Butterfield Distributor For Prompt Deliveries and Service

Union Twist Drill Company
BUTTERFIELD DIVISION
Derby Line, Vermont
In Canada: Rock Island, Quebec

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

ARMSTRONG WRENCHES

Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

WRITE FOR CATALOG

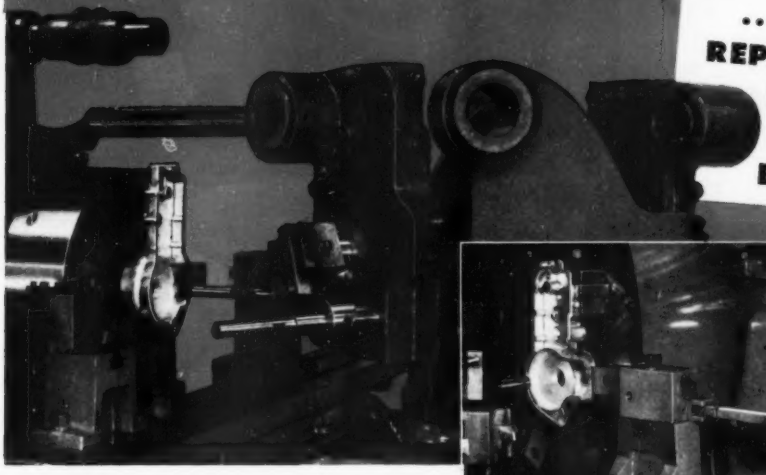
ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"*
5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

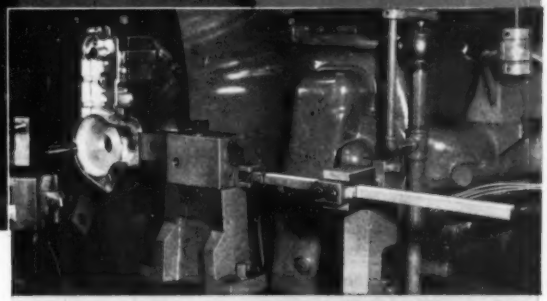
IT WILL PAY YOU WELL TO INSTALL MODERN

P&J AUTOMATICS

...ON NEW PRODUCTION

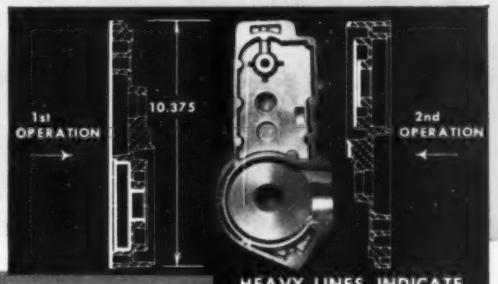
...OR AS REPLACEMENTS FOR TIRED, SLOW EQUIPMENT





This P&J engineered Facing Tool on the cross slide machines the front surface of these castings. It is self-relieving, thereby eliminating objectionable tool return marks on the face of the work.

HERE'S an example: a single P&J 5DE AUTOMATIC, equipped with standard and special Tooling designed by P&J experienced specialists, turns out these intricate housings of cast aluminum — taking 21 cuts in all for both first and second operations (see drawings at right). If you have need for *quantity production* of similar quality work, get a time estimate from P&J; no obligation.



HEAVY LINES INDICATE MACHINED SURFACES

POTTER & JOHNSTON Co.

Subsidiary of PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
PAWTUCKET, RHODE ISLAND, U. S. A.

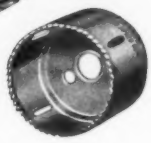
Precision Production Tooling for 53 years

Numerous similar examples of productivity with P&J Tooling on P&J AUTOMATICS are shown in this free booklet. Write for your copy.

Cut...

LARGE HOLES

. . . thru any machineable material up to $1\frac{1}{8}$ *INCHES* thick!



Here is a premium tool which makes it possible to saw holes in one short operation . . . large holes which heretofore had to be laboriously machined "a-chip-at-a-time."

MARVEL High-Speed-Edge Hole Saws have strength to withstand the terrific peripheral strains of heavy duty operation in lathes, drill presses or portable power tools. They have a high speed steel cutting edge which is electrically welded to a tough, alloy steel body, high speed steel pilot drills, heavy hexagonal shanked arbors and sufficient set for deep drilling. They are self-aligning, as the larger diameter saws float on their arbors and are driven by double drive pins. They will saw round holes accurately in any machineable material.

MARVEL High Speed-Edge Hole Saws come in 35 sizes, from $\frac{5}{8}$" to $4\frac{1}{2}$". They are carried in stock by leading industrial distributors.

WRITE FOR BULLETIN ST-49

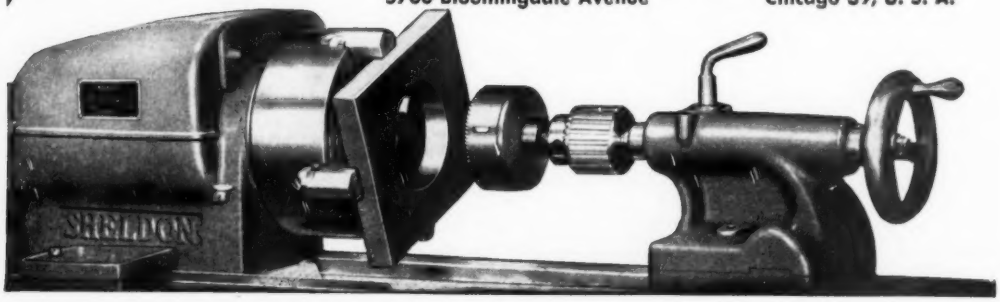
"MARVEL" *has Always had the edge!*

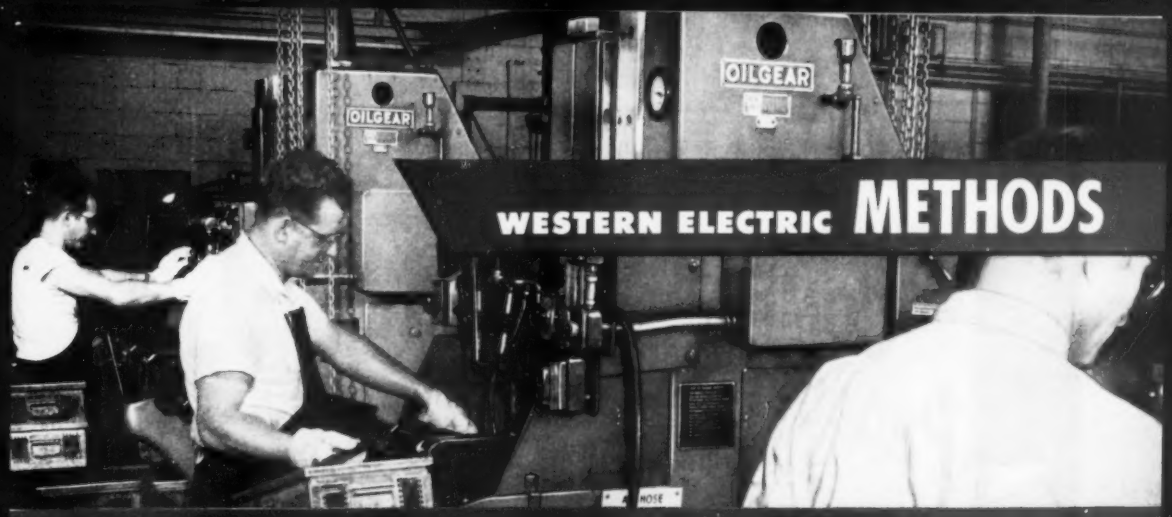
MARVEL *Metal Cutting* **SAWS**

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Avenue **Chicago 39, U. S. A.**





WESTERN ELECTRIC METHODS

INCLUDE OILGEAR MACHINES FOR BROACHING STAMPINGS

7 OILGEAR VERTICALS AT CHICAGO

The Western Electric Company, outstanding in the manufacture of all types of telephone equipment, has used Oilgear Broaching Machines since 1928. Some of the Vertical Surface Broaching Machines shown above have been in service more than 10 years. The machines in the upper panel finish broach four edges on stampings for crossbar switches. Production for each machine is in excess of 600 pieces per hour. The Oilgear Verticals in the lower panel finish broach two knife edges on steel stampings used as the armatures of crossbar relays. Here too production from each machine is more than 600 pieces per hour.

Oilgear Broaching Machines offer you many advantages as standard which are exclusive with Oilgear or are to be found elsewhere only at extra cost.

Oilgear Machines are often bought to replace other types of equipment and represent tremendous gains both in initial savings and in greatly increased production. This is true in the case of small factories where every capital investment must be carefully made, and in the case of large industrials where production is largely given over to semi-automatic and fully automatic machines, and unfailing dependability becomes just that much more vital. It will pay you to investigate what Oilgear Broaching Machines can do for you. THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wisconsin.

OILGEAR

Oilgear

PIONEERS IN FLUID POWER

BROACHING MACHINES AND PRESSES

HERE COMES PRODUCTION!

LODGE & SHIPLEY POWER and RIGIDITY FOR THE HEAVIEST CUTS

. . . precision for the most exacting work!

This gigantic Model X 32" Standard Lathe, 30 feet between centers, will have vital use in the defense effort at a large California arsenal.

Whether for defense or civilian production, preference for Lodge & Shipley Lathes is easily understood. The latest in money-making and saving features are incorporated in these lathes: higher speeds, greater horsepower and all-round ruggedness permit the application of the most modern tooling.

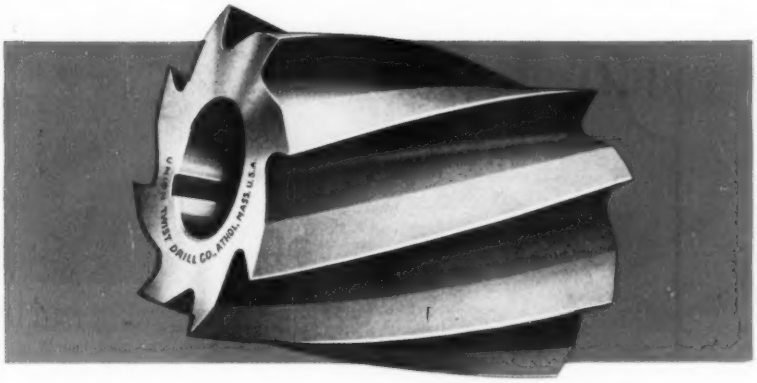
Whether used in production, tooling or maintenance, only the most modern lathes . . . LODGE & SHIPLEY . . . can be truly profitable producers. Write for detailed literature.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

ENGINE, TOOLMAKER, MANUFACTURING, GAP AND OIL COUNTRY MODEL "X" LATHES, COPYMATIC, DUOMATIC and T-LATHES.

You cut downtime, increase output with UNION *Profile Cutters*



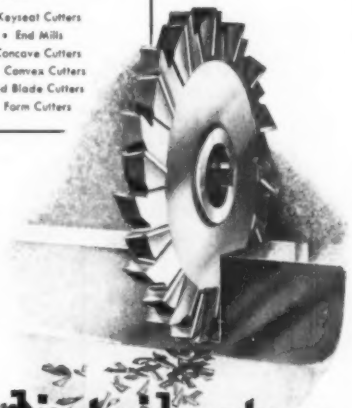
You can depend on a *minimum* downtime for reconditioning when you use Union high speed steel heavy duty profile cutters. Their undercut teeth have a special spiral angle that assures unusual efficiency and permits resharpening without rapid increase in width of land. Note the wide spacing, too. It allows ample chip room, and makes possible exceptionally strong teeth. Because there are fewer teeth in contact with the work, you also save on power.

Union profile cutters are performance proved. Rely on them for the toughest jobs in the shop. They work to closest tolerances, produce outstanding results from old or new machines. Available in 12 sizes ranging from 2½" to 4½" diameter.

A MILLING CUTTER FOR EVERY JOB

Whether you need special cutters built to your specifications or can use the standard Union cutters, there's a Union milling cutter to meet your needs. Following is a partial list —

Plain Milling Cutters • Keyseat Cutters
Helical Milling Cutters • End Mills
Metal Slitting Saws • Concave Cutters
Screw Slotting Cutters • Convex Cutters
Slitting Shears • Inserted Blade Cutters
Side Milling Cutters • Form Cutters



no other profile cutter will outperform a UNION

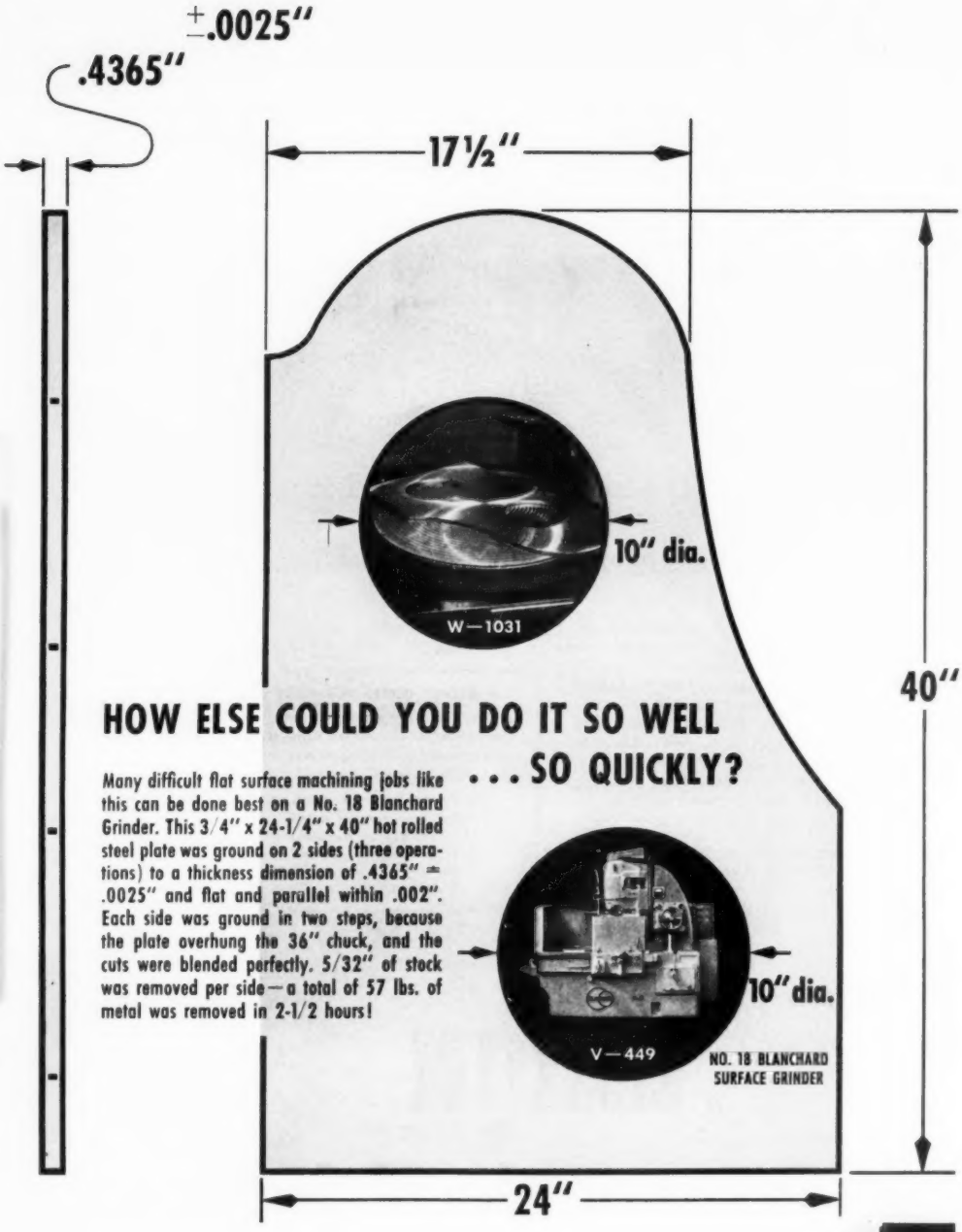
contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist".

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.



HOW ELSE COULD YOU DO IT SO WELL . . . SO QUICKLY?

Many difficult flat surface machining jobs like this can be done best on a No. 18 Blanchard Grinder. This 3/4" x 24-1/4" x 40" hot rolled steel plate was ground on 2 sides (three operations) to a thickness dimension of .4365" ± .0025" and flat and parallel within .002". Each side was ground in two steps, because the plate overhung the 36" chuck, and the cuts were blended perfectly. 5/32" of stock was removed per side—a total of 57 lbs. of metal was removed in 2-1/2 hours!

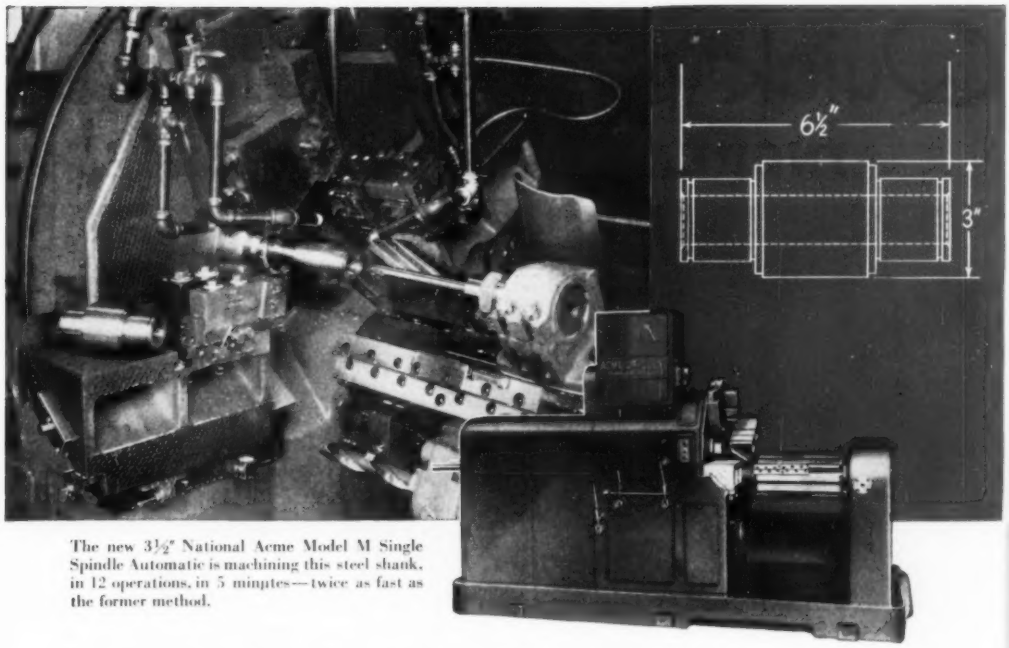
NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



The new 3½" National Acme Model M Single Spindle Automatic is machining this steel shank, in 12 operations, in 5 minutes—twice as fast as the former method.

Steel Shanks Machined Twice as Fast

—AND TO .001 CONCENTRICITY

The new Acme-Gridley Model M Single Spindle Automatic has the strength to maintain close tolerances, such as the .002 total indicator reading for concentricity between the outside diameters and reamed hole of the steel shank illustrated. The rugged open frame provides plenty of room for chip clearance and for easy tool adjustment, too.

Frame strength adequate for high speed or carbide tools helps the Model M chalk up production records like this one. But that's only part of the Model M's time-saving story. Eight independently operated tool slides and three ranges of automatic spindle speeds permit the use of speeds and feeds best suited to each cut. Several short end operations can be performed while heavy forming cuts are being made from the side slides.

For increased production, increased *profit*, get the new Model M—tops for ease of operation, speed, stamina and economy. It's built in three capacities from 3½" to 5½". Ask for production estimates on your jobs.

● Complete information on the new Acme-Gridley Model M Single Spindle Automatic is contained in Bulletin M-50. Ask for your copy.

Machine obsolescence is the creeping paralysis that strangles profits.

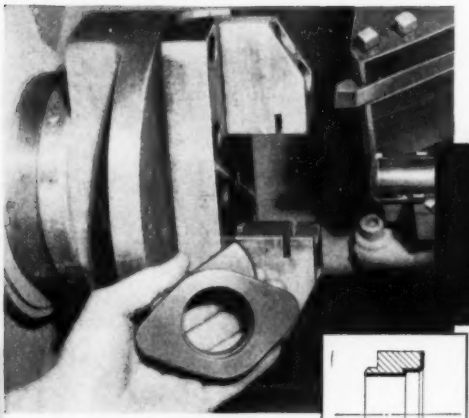
The NATIONAL ACME CO.

170 EAST [illegible] STREET • CLEVELAND 8, OHIO

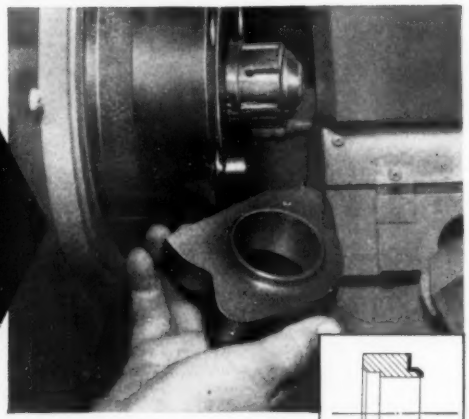
Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog-Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Quick "pass-along" idea

INCREASES PRODUCTION

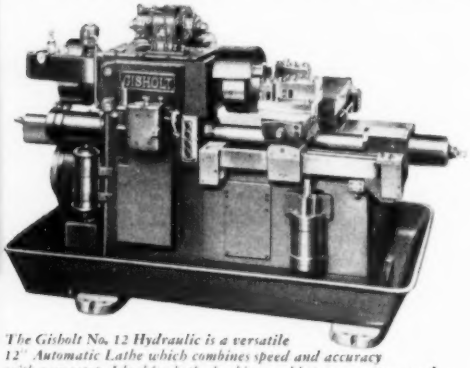


FIRST OPERATION: the rear slide tools face the body; front carriage tools bore, counterbore and chamfer the hub.



SECOND OPERATION: rear slide tools face both hub and body; tools on front carriage turn and chamfer hub.

with pair of GISHOLT No. 12 Hydraulic Automatic Lathes



The Gisholt No. 12 Hydraulic is a versatile 12" Automatic Lathe which combines speed and accuracy with easy setup. Ideal for both chucking and between-centers work.

One operator with two standard machines now handles these cast iron manifold bodies in rapid succession—at a pace of 80-per-hour, at 80% efficiency.

This two-machine team pays off many ways: The operator loads and unloads one machine while the other is working—*automatically.* Investment is at a minimum because both machines *and* tooling are standard. Tool setups and replacements are simple.

Whether you have continuous runs like this or even smaller job lot work—the speed and automatic operation of the Gisholt No. 12 Hydraulic may be your answer to lower costs. It's worth investigating.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

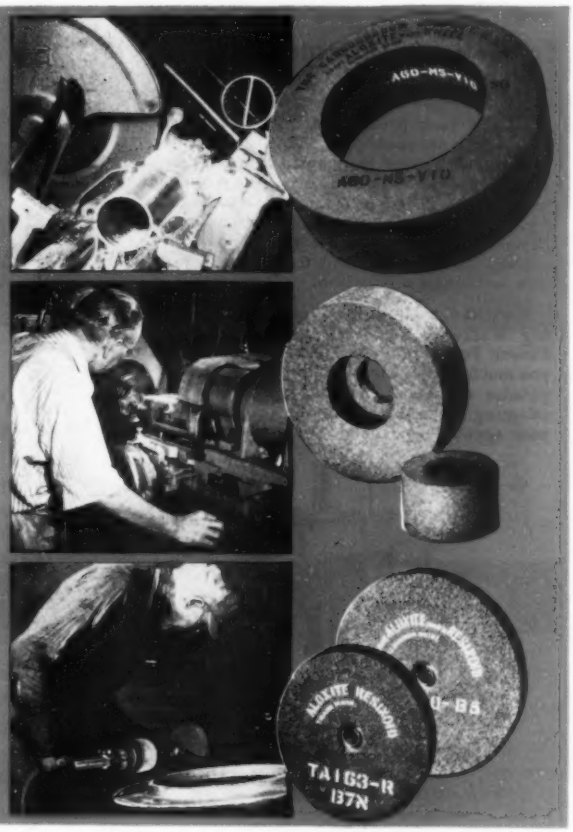
The RIGHT Abrasive gets the job done BETTER

You can be sure of using the right abrasive in every case by selection from the *complete* CARBORUNDUM line... the only complete line of abrasives manufactured under one brand name. For utmost economy in metalworking, you'll find it pays to standardize on abrasives from the *complete* CARBORUNDUM line.

● Improved V10 Bond Centerless Grinding Wheels by CARBORUNDUM are engineered to maintain grinding efficiency with minimum contact pressure. Their cool free cutting action makes them ideal for heavy stock removal on both hard and soft materials.

● Excellent form holding qualities, less wheel dressing and fewer machine adjustments during a run are outstanding features of Internal Grinding Wheels by CARBORUNDUM. Effectively applied to wide range of work; low inventory requirements.

● Bonded products by CARBORUNDUM for general purpose and weld grinding expedite a high rate of production at lowest cost. Typical example is the Type 1 Portable Grinding Wheel with *built-in* rubber bushing, which reduces wheel "bounce"... lessens operator fatigue.



See Your **CARBORUNDUM** distributor... or write Dept. AM 81-25.

Only CARBORUNDUM

TRADE MARK

makes ALL Abrasive Products ...to give you the proper ONE

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81-25

Designed to meet any drilling problem—

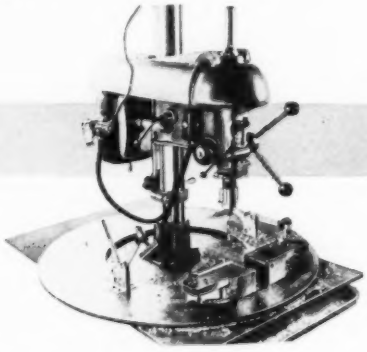
HEAD ON

WALKER-TURNER DRILL HEADS

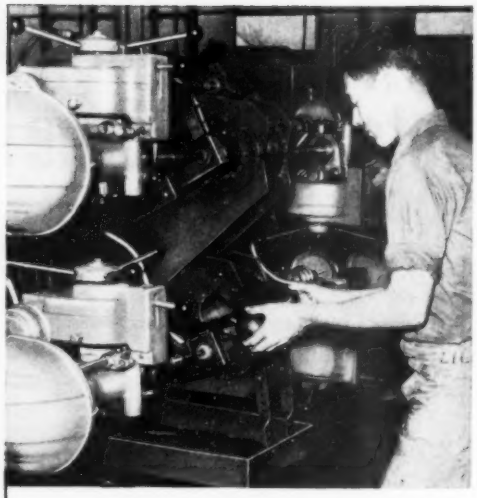
work at all angles, handle work faster, and cut machining costs

Whatever your production needs, Walker-Turner Drill Heads are readily adaptable for special set-ups. They are designed to operate continuously at any speed from 400 to 2600 or more r.p.m. They can be operated in any position, and attached to other equipment. They have a wide range of application. Pictured are a few of the ways industry is capitalizing on this flexibility, to simplify work handling and speed production.

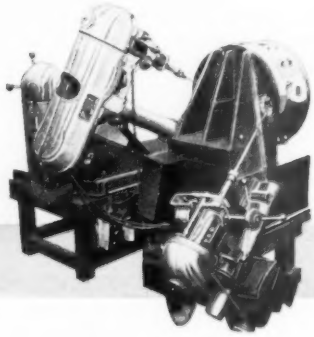
Very likely *you* can save time and money by building Walker-Turner Drill Press Heads, Hand or Power Feed, into your production machinery. If you machine steel, iron, aluminum, copper or brass, plastics or wood, investigate the possibilities of adapting these low-cost, high production tools to your specific needs. Send for catalog.



IN OPERATIONS LIKE THIS, requiring a rotary motion combined with a reciprocating action, the adaptability of the Walker-Turner Drill Head gives you greater production capacity. By using a circular jig and allowing the drill head to revolve radially on the column, a continuous series of holes may be drilled in rapid succession.



EIGHT SEPARATE OPERATIONS ARE CONSOLIDATED into one with this set-up. Four standard Walker-Turner Power Feed Drill Heads are mounted horizontally to drill both ends of two double-end tube closures simultaneously.



THIS JIG APPLICATION IS TYPICAL of Walker-Turner Drill Head flexibility. Due to the weight of the work and the cumbersome special jig required, provision was made, in designing the fixture, for attaching the drill heads in correct position. Result: work can be loaded in a natural position, production is speeded up.

SOLD ONLY THROUGH AUTHORIZED DEALERS

WALKER-TURNER

• DIVISION •

KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS • BELT and DISC SURFACERS
METAL-CUTTING BAND SAWS • METAL-SPINNING LATHES • SPINDLE SHAPERS • JOINTERS

How many men on a surgeon's team?

On the team we have in mind, more than you can count. And none of them is a doctor!

We're talking about the team that produced this surgical knife blade handle, made by the Christy Surgical Company of Cincinnati, and used by surgeons throughout the world. Both the surgeons who use it, and Christy who makes it have very definite ideas about the properties of the metal from which it's made.

Surgeons demand that it be strong, lest it bend or break. The manufacturer demands that it be easy to fabricate, machine readily, be easy to finish and polish and that its precision blade-slot wear well.

In the past these handles have been made from brass castings, wrought brass and stainless steel. None of these met *every* requirement. Now they're hot-forged from ANACONDA Nickel Silver.

We stress the fact that ANACONDA Nickel Silver was chosen because its superior forging qualities permit fabrication with progressive dies to the close tolerances demanded.

We should like you to know that, on any product you may make of ANACONDA Nickel Silver, Copper or other Copper Alloys, we are as concerned with suggesting the best manufacturing procedure as well as helping you develop the best product. 5110S

For technical assistance of any kind, or for a copy of Publication B-28 which provides detailed information on ANACONDA Metals and Metal Products, just write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

ANACONDA® – *the name to remember in* **NICKEL SILVER**

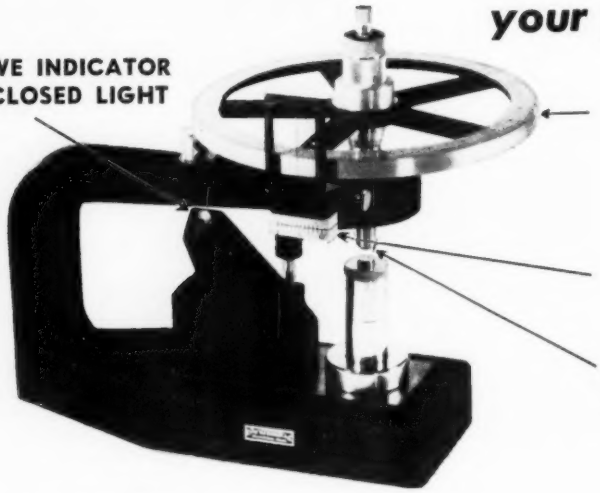
sheets • wire • rods • tubes

and special shapes

THE NEW

Van Keuren 0 to 3" LIGHT WAVE MICROMETER

will improve your product . . .



CATALOG AND HANDBOOK
No. 34

This 208-page volume represents 2 years research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request. ●

THE Van Keuren Light Wave Micrometer is an instrument of exceptional merit, proven over a period of 15 years. It has enabled hundreds of High School boys and girls to produce and inspect parts to "Hundred Thousandths" of an inch.

The New 0 to 3" Light Wave Micrometer has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non parallax, vernier index which enables readings to be made to .00001". It has an index lock. It has carboloy tipped anvil and spindle. It is a sturdy, yet sensitive instrument which weighs 17 pounds. It is a portable measuring machine, built for "Sustained Accuracy."

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision—fast, accurate and profitable.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

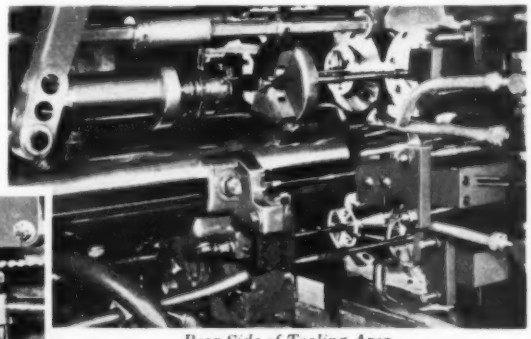
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

Although certain types of shaft jobs offer natural opportunity as bar machine work, with the exception of the CONOMATIC, seldom do they appear on multiple spindle bar automatics. In general, shaft jobs require a longer tooling area than do other types of bar work.

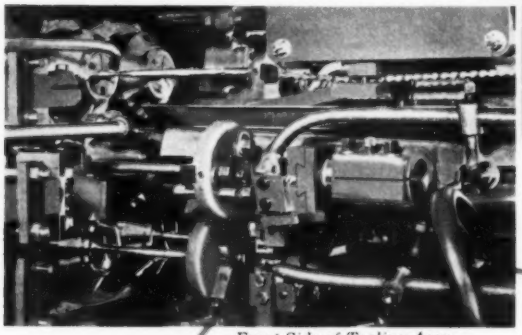
A glance at the frame design of the CONOMATIC explains why its tooling area is longer* than the tooling areas of other "automatics." And there are more tool positions* and more room* for tool setting for *any* type of job.

*You can have the figures

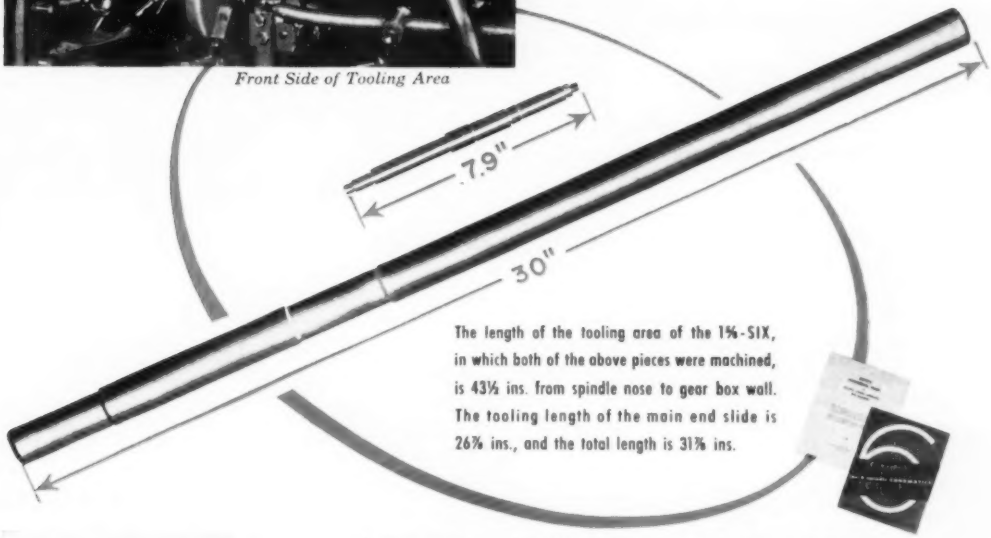
THERE'S *More* THAN JUST *"Elbow Room"*



Rear Side of Tooling Area

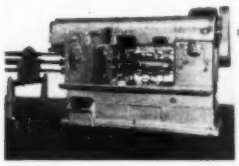


Front Side of Tooling Area



The length of the tooling area of the 1⅝-SIX, in which both of the above pieces were machined, is 43½ ins. from spindle nose to gear box wall. The tooling length of the main end slide is 26⅞ ins., and the total length is 31⅞ ins.

A Comparison of ALL Automatics is in favor of Cone



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Firth Sterling

STAR·MO M-2

conserves critical materials to everyone's

ADVANTAGE!

- ★ 29% Lower Base Price
- ★ 7% More Tools per Pound *(lower spec. grav.)*
- ★ Tougher than standard 18-4-1 Class B High Speed
- ★ Very good abrasion resistance
- ★ Lower Hardening Heats

Lower power consumption
Reduced wear on salt bath equipment

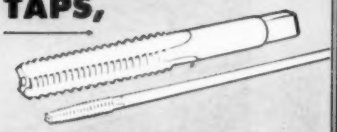
Star-Mo (M2) turns the necessary substitution requirements of NPA to *big advantages* for High Speed steel users.

Firth Sterling's Star-Mo (M2) is tougher than the standard 18-4-1 Class B High Speed when it is in the heat treated condition. Star-Mo (M2) also has an abrasion resisting quality approximately equal to the standard Class B 18-4-1 steel.

Write for Bulletin SL-2036

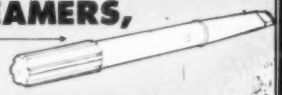
Specify STAR-MO *(M-2) for . . .*

TAPS,

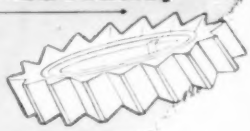


TWIST DRILLS,

REAMERS,



MILLING CUTTERS,



BROACHES,

THREAD CHASERS, LATHE and PLANER TOOLS

Firth Sterling

STEEL & CARBIDE CORPORATION

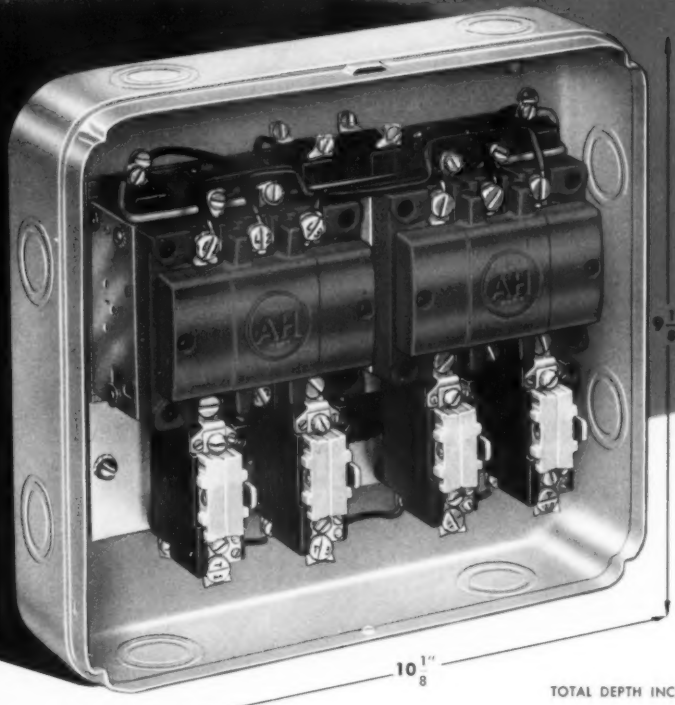
3113 Forbes Street, Pittsburgh 30, Pa.

Offices and Warehouses:* HARTFORD, NEW YORK*, PHILADELPHIA*, PITTSBURGH*, CLEVELAND, DAYTON*, DETROIT, CHICAGO, BIRMINGHAM*, LOS ANGELES.

R-243

ARROW AH HART

MULTI-SPEED and REVERSING MOTOR STARTERS

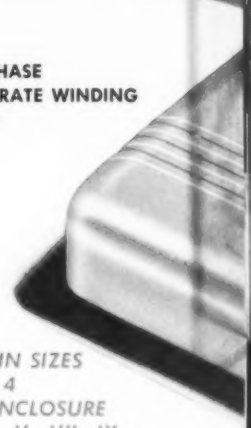


TOTAL DEPTH INCLUDING COVER 4"

feature

- STRAIGHT-THRU FRONT WIRING
- "RA" ADVANCED DESIGN
- SMALL SIZE
- LIGHT WEIGHT
- POSITIVE INTERLOCK

SIZE 1 — 3 PHASE
2-SPEED SEPARATE WINDING
NEMA TYPE I



Wherever A.C. across-the-line type of motors are employed, the advanced design of Arrow-Hart Multi-Speed and Reversing Starters will assure maximum rated performance and long motor life. The revolutionary "RA" design is years ahead of present day solenoid type controls — a fact acknowledged by more and more design-engineers, electricians, distributors and buyers. An exclusive A-H balanced knee-action bellcrank fulcrum mechanism accounts for superior operating performance in just ½ the space required by conventional controls — ½ the weight, too. Other features include 50 to 60% better arc resistance; big, rugged contacts; straight-thru front wiring; positive mechanical interlock; overload protection; easy to wire and easy to service. Be convinced! Write for folder complete with operating features, dimensions, ratings and other information.

AVAILABLE IN SIZES
0, 1, 2, 3, 4
IN NEMA ENCLOSURE
TYPES I, IV, V, VII, IX

BUY WITH CONFIDENCE PROFIT BY PERFORMANCE

THE ARROW-HART & HEGEMAN ELECTRIC CO., HARTFORD, CONN., U.S.A.

ELECTRICAL CONTROLS

ARROW AH HART

ESTABLISHED 1890

JUST 1 ARROW-HART 2-SPEED STARTER TO SERVE 3 MOTOR TYPES

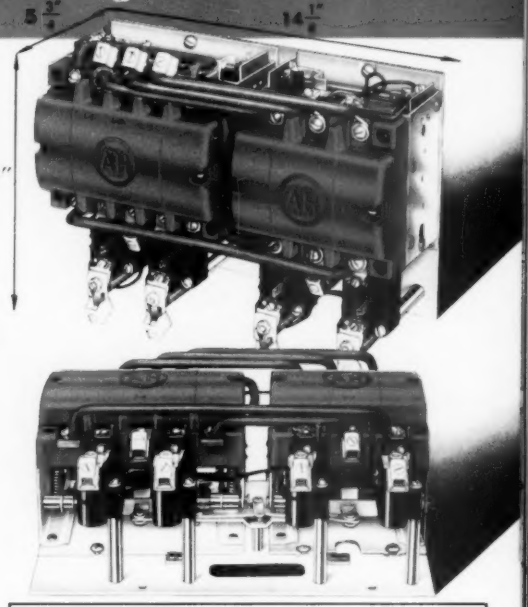
CONSTANT TORQUE | VARIABLE TORQUE | CONSTANT HORSEPOWER

EXCLUSIVE "RA" DESIGN

FIRST TO BRING YOU STRAIGHT-THRU FRONT WIRING PLUS POSITIVE INTERLOCKING DEVICE.

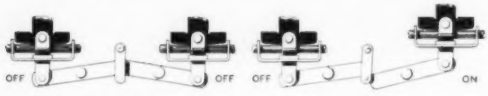
Arrow-Hart Multi-Speed and Reversing Starters, affording unusual flexibility with reliability, are available in multi-speed for separate wound motors or consequent pole for reconnected type motors and reversing, in single phase, two or three phase and two phase four wire. Sizes 0, 1, 2, 3 and 4. One single 2-speed, consequent pole reconnected type can be used with constant torque, variable torque or constant horsepower motors.

SIZE 3 — 2 speed reconnected winding — 3 phase, note location of positive interlock (in "OFF" position). Wiring diagram points up simple straight-thru front wiring with vertical overload relays.



POSITIVE MECHANICAL INTERLOCK

Free release transfer action consistently true. This principle positively prevents closing of both sets of contacts of an interlocked control at any one time. Special roller type, free-floating deflective linkage assembly is positioned on a braced and true structure, eliminating binding or sluggish action. Reverse contacts do not close until forward contacts are completely open.

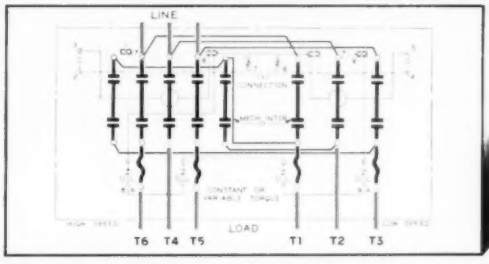


OFF POSITION **ON POSITION**

STRAIGHT-THRU ALL THE WAY

Huge savings in space, time and work are accounting for growing acceptance of Arrow-Hart motor controls by installation and maintenance men. Straight-thru wiring with vertical overload relays accounts for faster and neater layouts at savings up to 30%, direct routing without crossovers, and immediate circuit identification.

Consult your local distributor or write the factory for engineering service.



ARROW-HART

INDUSTRIAL CONTROL DIVISION

WRITE FOR FOLDER

COMPLETE WITH RATINGS, DIMENSIONS, WEIGHTS AND ENGINEERING DATA.

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, 103 HAWTHORN STREET, HARTFORD 6, CONNECTICUT, U.S.A.

Branches In: BOSTON, CHICAGO, CLEVELAND, CINCINNATI, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, SAN FRANCISCO, SYRACUSE. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO

PRINTED IN U. S. A.

Look to MODERN for accurate, fast, economical thread cutting

Hardened and ground throughout

Wider threading range

Made with least number of parts

Cut close-to-shoulder threads without special chasers

Easily adjusted for thread size

Greater flexibility

Quick and easy chaser change

MODERN

STATIONARY TYPE SELF-OPENING DIE HEADS

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern Self-Opening Die Heads thread diameters from ⅛″ to 7″ in standard heads, and up to 14″ in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

For complete information, write for Bulletin No. M-123

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

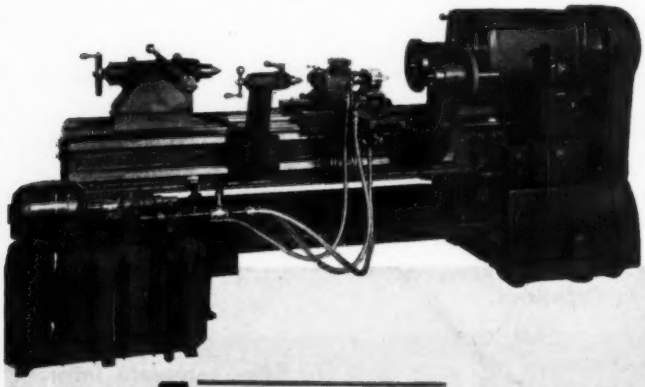
ROCHESTER 10, NEW YORK

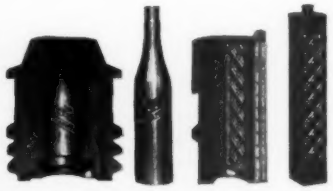
WITH SPRINGFIELD HYDRAULIC REPRODUCER

Now you can secure **accurate** three dimensional contour reproductions with the completely hydraulic, super-sensitive Springfield Reproducer on Springfield Geared Head Lathes. Reproduces internal, external, and face contours using a master, a template or the piece itself. Holds reproduction to extreme limits of accuracy.

Its usefulness and versatility are remarkable—it will trace a compound curve, follow the flats of a square milk bottle, profile and write simultaneously, bring out every detail of the most intricate design, turn a straight, smooth taper on a bar, cut a perfect spiral or a large cam and perform many similar money-saving, time-saving jobs that come up constantly.

Write today for catalog and complete information. We will gladly demonstrate on your work to show what the Springfield Reproducer will do.





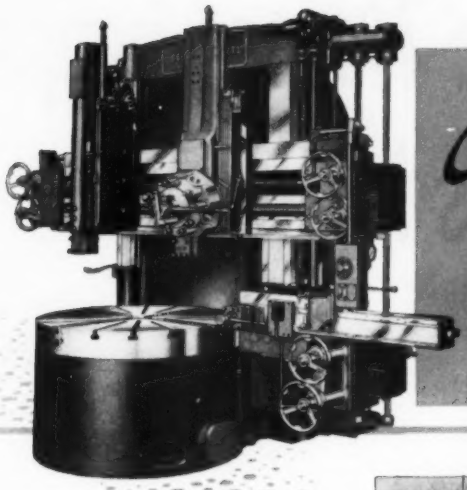
Just two examples from many of the accurate reproductions from Springfield Reproducers. Letters and figures reproduced from the master; intricate designs reproduced on flat surfaces.

THE SPRINGFIELD MACHINE TOOL COMPANY

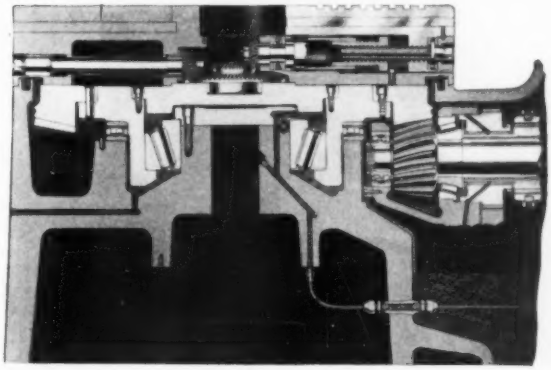
SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities



Refinement in DESIGN



All 6 sizes of Cut Master and Man-Au-Trol Vertical Turret Lathes have this Table Carrier.

NO MORE EXPENSIVE FOUNDATIONS
Simplicity of Installation. Just a good firm floor—NO PITS—even for the larger sizes 54", 64" and 74" machines.

VERSATILITY OF RELOCATING
Pick up the machine and place it in the new location. No special foundation required.

SIMPLICITY AND MINIMUM COST OF MAINTENANCE
No need for lifting machine for bearing maintenance.

MINIMUM TABLE DEFLECTION
Under extremely heavy loads—both work and cutting—deflection is reduced to a minimum. Heavier cuts may be made and improved finish obtained on the work. Ask a Bullard Representative to go over this design with you.

BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT, U.S.A.

NEW Aircomatic® Process jumps Welding Speeds to NEW HIGHS

Aircomatic is a new metal arc welding process that permits high-speed welding of aluminum, of aluminum bronze and of stainless steel – *in all positions.*.

The process uses a bare wire electrode in coil form, continuously fed to the work within an inert gas shield. High current densities are used providing excellent penetration and high deposition rates, *permitting welding at speeds greater than ever before possible.*

Aircomatic welding has proved most economical . . . for its high deposition rate, in addition to permitting high travel speed, also makes possible fewer passes on heavy material, and faster, heavier deposits for overlay or build-up work. This means more weld per unit of arc time, whatever the job. Further, since the wire is bare and continuously fed through a shield of inert gas, electrode changes and slag removal interruptions are eliminated, thus permitting almost 100% arc time in using the high operating speeds.

SAVES 16 MAN-HOURS WELDING TIME . . . Dempster Brothers, Incorporated of Knoxville, Tenn., makers of the nationally-known "Dempster-Dumpster" found Aircomatic welding cut their aluminum container manufacturing costs.

The other method was slow – cumbersome, and ran the cost exceedingly high. With Aircomatic the same container was produced – at a welding cost reduction of approximately 16 man-hours.

Another important feature of Aircomatic welding is its minimization of distortion. This is due to its high speed operation (heat can be concentrated and moved rapidly along the work), plus the fact that a small amount of weld metal is all that's required in most joints.

The case studies on the opposite page show how this dramatic new welding process is helping others. While the facts and figures are startling, they could very easily be applied in your own shop . . . but find out for sure. Write . . . or phone your nearby Airco office. Ask for a copy of ADR 66: "Aircomatic Welding Process".

SAVES 4½ HOURS... Martin-Quaid Co., of Philadelphia, Pa., used the New Aircomatic Process to reduce the time and cost of welding huge stainless steel cylinders used in the manufacture of carpets. They found this revolutionary process cut materials cost 25% . . . and saved 4½ hours working time over the old method – and, at the same time, greatly increased the quality of the finished product.

REDUCES TIME . . . Consolidated Welding and Engineering Company, of Chicago, Ill., adopted the new Aircomatic process for welding aluminum separators. Immediately, major production and cost problems were solved: To weld one complete separator assembly took only 90 man hours – about 1/5 the time of other methods.

Further, Aircomatic's high current density and the attendant high welding speed confined the heating effects to the narrow weld-zone . . . completely eliminating distortion.

ELIMINATES LEAKS . . . Griffin & Company, of Louisville, Ky., found Aircomatic's high speed and the ability to make welds without interruption ideally suited to the fabrication of tanks for all-aluminum evaporative coolers. Production time and cost was cut to the minimum, and warpage and distortion were completely eliminated. Thus far, the company has made hundreds of these tanks without a single leak.

BOOSTS PRODUCTION 71% . . . The Stewart-Warner Corporation, South Wind Division, Indianapolis, Ind., join the upper and lower halves of its "Safe-Air Gas Home Heater" with the completely new, high-speed Aircomatic Process. This time-saving, cost-cutting process skyrocketed production 71% . . . and cut manufacturing costs in proportion.

A new Aircomatic motion picture "The Tool For The Job" is available for specialized groups. Ask your nearest Airco office about showings.

AIRCO

AIR REDUCTION

AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY
AIR REDUCTION PACIFIC COMPANY
REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL
Divisions of Air Reduction Company, Incorporated
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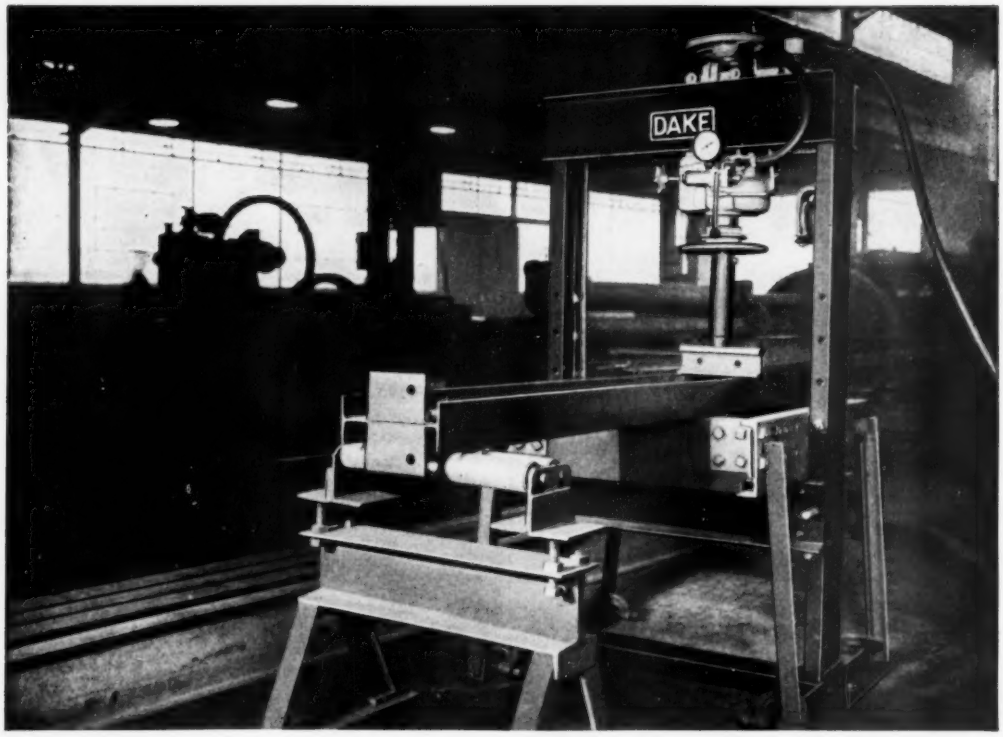


Straightening Time Cut 66%

in Steel Fabricating Plant by Using a Standard Model Dake Press

When a steel fabricating company recently sought a faster method for straightening I-beams and channels after welding, first reports indicated that a high-priced bulldozer would be required or that special equipment would have to be built for the job.

Dake engineers advised otherwise: "If you will equip our regular 50PA Air-Operated Press with a special table and screw nose," they said, "you should be able to materially reduce your straightening costs on all of your structural work." They bought the press and adapted the press to the job. (See illustration above.) The result . . . straightening time was sliced 66%; and they tell us the press paid for itself in the first two months of use.

If you have any kind of straightening, bending or pressing jobs where pressure is to be applied to metals, plastics, wood, etc., consider a regular Dake press first. If a regular model will not work satisfactorily, we will tell you so and will be glad to quote on custom-built equipment.

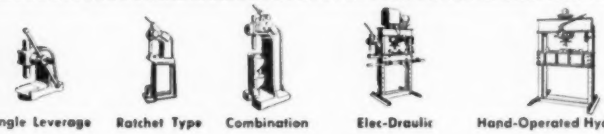
The complete line of regular-model Dake presses is illustrated and described in the folder which we invite you to send for . . . now.

Write for this Folder

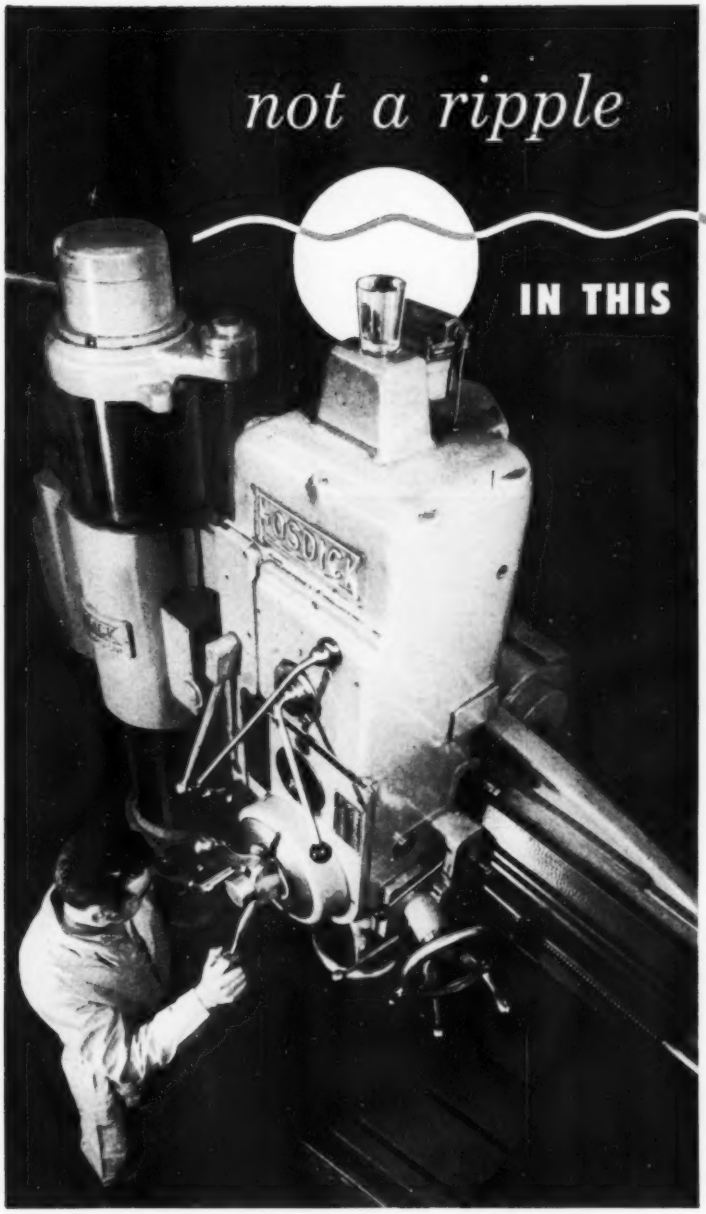
Dake Engine Company, 636 Seventh St., Grand Haven, Michigan

See us at Detroit — — Booth F-416
National Metal Exposition & Congress

DAKE
arbor and hydraulic
PRESSES



Single Leverage · Ratchet Type · Combination · Elec-Draulic · Hand-Operated Hydraulic



This Fosdick Hydraulic Radial drills so smoothly you can balance a brim-full glass of water on its head without spilling a drop. It takes rare engineering skill and master craftsmanship to turn the trick . . . to produce a machine that will drill continuously and accurately with a minimum of down-time and operator fatigue.

Performance like this is the result of leadership in the design of drilling equipment. *Fosdick was first* to use hydraulics in Radial Drill controls—hydraulics to clamp the arm and column—hydraulics to provide foolproof safety interlocks—to give you the *finest* Radial money can buy.

Get the whole story on the Fosdick Economax Hydraulic Radial Drill. Call your distributor today, or write for Bulletin RDA.

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

FOSDICK

"SKIL Drivers

pay for themselves over and over again

with less work and time for all our driving operations,"

says Mr. E. EPSTEIN, ALSCO MICHIGAN CORPORATION, Detroit, Michigan

SKIL Drivers turn the thousands of screws required for assembly and additional sturdiness in the aluminum storm windows and doors manufactured by the Alsco Michigan Corporation. That could be an expensive, difficult job . . . time-consuming and tedious . . . but with SKIL Drivers on the assembly line the screwdriving process is completed in a matter of seconds . . . *with 1/10th the work!*

SKIL Drivers on the assembly line mean a better job in less time and 1/10th the work!

The Alsco Michigan Corporation uses SKIL Suspension Drivers, Model 316. They're compact, light weight, easy to handle. They've got plenty of power to drive the screws securely, accurately, neatly.

Model 316

Used by the Alsco Michigan Corporation. Designed specifically for overhead suspension use. Recommended for efficient production line use for work of this kind, radios, toys, electrical appliances and other products of similar size. Adjustable clutch. Paddle switch. Capacity: ¼" diameter machine screws, nuts; or No. 12 self-tapping screws. No-load speed: 750 r.p.m. standard, other speeds optional. Overall length: 15⅞". Weight: 4½ pounds. Model 346 is identical but with reversing switch.

SKIL Drivers . . . available in 20 heavy duty models

A complete line of electric screw drivers and nut runners to meet practically all industrial requirements with peak efficiency. Wide range of capacities. Available in required speeds, with positive or adjustable clutch, with or without reversing switch. Call your SKIL Distributor for complete information, recommendations and an on-the-job demonstration.

SKIL Saw | SKIL Belt Sander | SKIL Disc Sander | SKIL Drill

SKIL PORTABLE TOOLS

SKIL Products are made only by Skilsaw, Inc. • 5033 Elston Avenue, Chicago 30, Ill.

Skilsaw Factory Branches in principal cities • *In Canada:* Skiltools, Ltd., 3601 Dundas Street West, Toronto 9, Ont.

CYLINDER POWER

increases production

UP TO 100%...

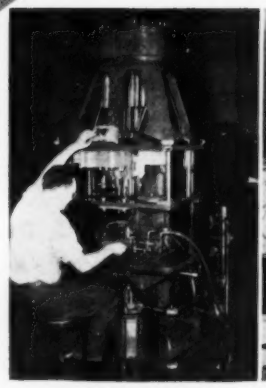
Use It 1001 Ways For Pushing, Pulling, Lifting, Pressing, Clamping, Controlling

INVESTIGATE Hanna Cylinder Power to speed production and lower costs. Hanna Air and Hydraulic Cylinders are used in hundreds of applications throughout industry—in all types of machines and equipment—to get things done faster, relieve tiresome manual operation, simplify actuation and control. Cylinder Power is easily adaptable, safe and inexpensive!

HANNA
AIR and HYDRAULIC CYLINDERS

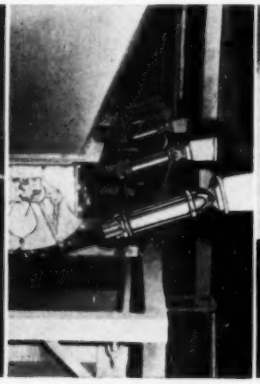
Send for Catalogs

Ask for Catalog No. 236 for Hanna Low Pressure Cylinders — Catalog 233A for Hanna Hydraulic Cylinders and Catalog 254 for Hanna Valves.



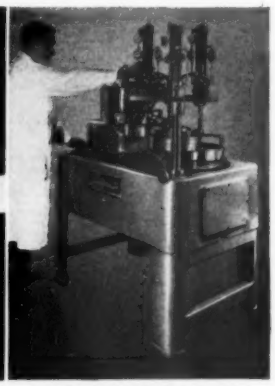
REDUCES FATIGUE

One pushbutton starts the Natco cycle for continuous, automatic operation of this drilling machine. Hanna Hydraulic Cylinders feed the table and Hanna Pneumatic Cylinders engage drillpress clutch and workpiece clamp.



REMOTE CONTROL

What could be more simple and dependable for opening and closing these hopper gates than Hanna Cylinders? They are operated from remote station with Solenoid Valves and Pushbutton Panel.



DOUBLES PRODUCTION

Hanna Air Cylinders raise and lower the entire conditioning ring-pressure plate units to permit fast, efficient loading and unloading of parts on this Lapmaster. In many cases, production has been doubled over manual operation.

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1740 Elston Avenue, Chicago 22, Illinois

SPECIALIST in VARIETY

SELECTOR SWITCHES PROVIDE CHOICE OF THESE MAXIMUM CAPACITIES AND CORRESPONDING SPEEDS

SINGLE ACTION		DOUBLE ACTION (Figures refer to inner slide only. Blankholder maximum capacity 500 tons in all cases.)	
MAXIMUM CAPACITY (Tons)	SPEED (Inches per minute)	MAXIMUM CAPACITY (Tons)	SPEED (Inches per minute)
333	264		
667	132		
833	104		
1000	88	333	264
1167	75	667	132
1500	58	1000	88

Quick approach and return—400 inches per minute.

Most Clearing presses are built to do some special job with maximum production efficiency and thus at minimum cost per piece But when the customer's requirement is for a press of wide utility, to take a great variety of work, Clearing still comes up with the right answer

This hydraulic press can handle a draw of 30" with ample space for lift out. Yet when the work is shallow, it has a minimum shut-height of only 20". All of its 1500 tons capacity can be applied as a single action press, but movement of a few selector switches and removal of brackets makes it a double action machine with a 500 ton blankholder and 1000 ton punch. No slide bolster is necessary. Capacity can be reduced to as little as 333 tons with corresponding increase in pressing speed, and changed back again, with electric switches.

Quick, easy adjustment from one kind of work to another makes this specialist in variety a practical, economical answer to short run or jobbing problems. Ask us to show you how this press, or a different sized variation of it, can fit your requirements.

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET ★ CHICAGO 38, ILLINOIS

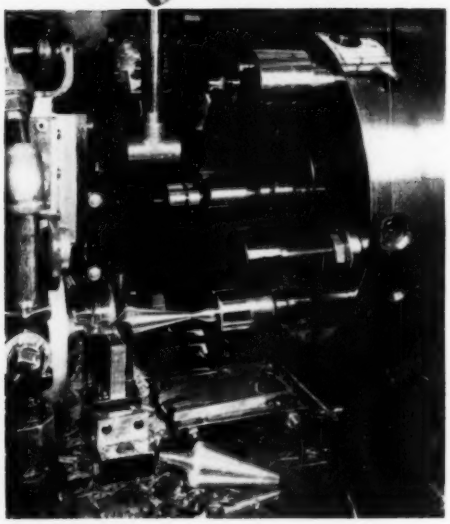
CMC CLEARING

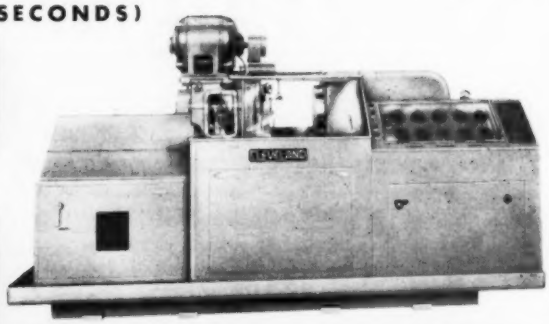
CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

they're picking "choice plumbs" from this CLEVELAND dialmatic!

(ONE EVERY 100 SECONDS)





Part: Plumb Bob
Material: 1-9/16" Free Machining Brass
Production: 36 pieces per hour

OPERATION SEQUENCE

Turret Position	Operation
No. 1	Gauge.
No. 2	Drill and Countersink for Tap and Broadface.
No. 3	Taper Turn with special Mill mounted in turret but guided by Cam Track on Front Cross Slide.
No. 4	Tap No. 10-32 thread.
No. 5	Steady with Anti-Friction Center. Finish Form from Rear Slide. Roll Thread from Front Slide.

Cut-Off with Independent Cut-Off Attachment.

For a quick but complete description of the single spindle automatic of tomorrow—write for your free copy of this new bulletin, *today!*

CLEVELAND MODEL AB DIALMATIC

Single Spindle Bar and Chucking Automatic
2½" and 3" Bar Capacity: 6" chucking capacity

This plumb bob is one of many precision parts being produced by a famous manufacturer of engineers' and surveyors' instruments and supplies. For this prominent firm, these parts are all "choice plums", as they are now being turned out in *less* time and at *less* cost on a new 2½" Model AB Cleveland Dialmatic.

Cleveland engineers have created in the Model AB Dialmatic a versatile, precision automatic screw machine, unsurpassed in its production possibilities. Here is an automatic so *easy* to set-up, that jobs formerly scheduled on hand-operated machines are "naturals" for the Cleveland Dialmatic.

No cam changes are necessary to adjust turret tool feeds. With Cleveland's exclusive *Electric Feed Drive*, highly accurate and infinitely adjustable feeds are pre-selected for the five turret positions, simply by setting dials on the control panel.

In addition to bar work, the Cleveland Dialmatic can be *converted to a chucker* in 30 minutes by substituting a simple, low-cost 6" power chuck attachment for the bar feed assembly in the spindle. This double-duty flexibility is ideal for shops having occasional chucking jobs to run.

You should get full details on the new Cleveland Dialmatic now! Contact your nearest Cleveland representative—find out how much you can save on your parts production.

Remember *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio
SALES OFFICES: CHICAGO
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Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

POP'S school of Filing

POP SEZ - FILES ARE FIGHTIN' TOOLS!
NO EXCUSE FER FILE ABUSE---EH, POP?
POP'S A STICKLER FER FILE EFFISHUNCY!
DON'T throw files on top of one-another. (Scuffs, blunts and chips teeth)
DO keep files separated (in racks)
DON'T let files rust. (Corrodes and dulls teeth)
DON'T let files become clogged with dirt or filings
DO "tap" file frequently (on wood) to loosen chips; also clean with file brush or "card"
DON'T put too much pressure on forward file stroke
DON'T drag file back under needless pressure
DO use the right file for the job
DO use good, long-lasting files....
NICHOLSON U.S.A.
BLACK DIAMOND

Many a foresighted and long-headed shop foreman of Pop's type is often unjustly regarded as "just an old fuss-button." But in establishments where files are an important item in the tool budget, abuses and misuses like those indicated above can run production costs ragged. The waste isn't in the excessive consumption of files alone. That, relatively, is merely a "drop in the bucket." Where it really hurts is in the solar plexus of today's production costs: *labor* — from losses due to file neglects and waste in workmen's time.

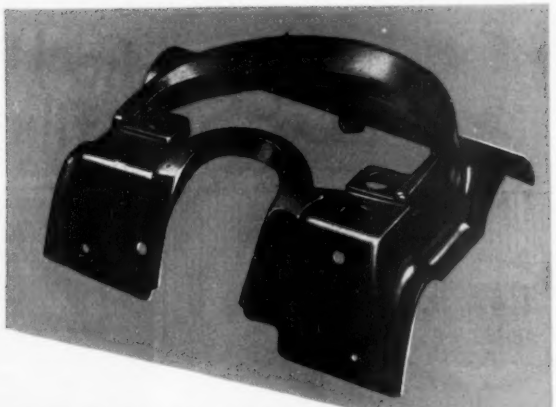
With the national emergency calling for both greater production and the conservation of steel and other war-essentials, the selection of longer-lasting Nicholson or Black Diamond files serves both those ends. Taking care of files (see Pop's DO's and DON'Ts above) and always using *The right file for the job* effect still further economies. Let your industrial distributor help you lead the way. And for a helpful file manual, send for the book below.

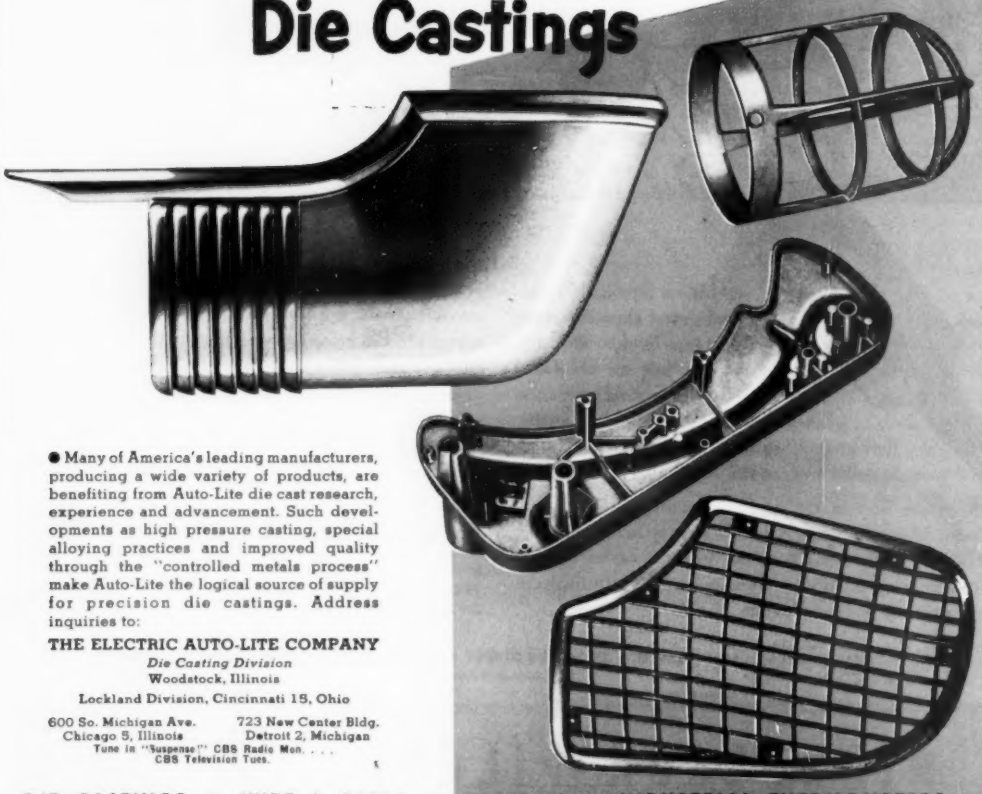
HOW TO SELECT, USE AND CARE FOR FILES is helpfully expounded in Nicholson's famous 48-page illustrated book, "***File Filosophy.***" Write for as many copies as you can use. FREE.

NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*

You're always right with AUTO-LITE Die Castings





● Many of America's leading manufacturers, producing a wide variety of products, are benefiting from Auto-Lite die cast research, experience and advancement. Such developments as high pressure casting, special alloying practices and improved quality through the "controlled metals process" make Auto-Lite the logical source of supply for precision die castings. Address inquiries to:

THE ELECTRIC AUTO-LITE COMPANY
Die Casting Division
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Lockland Division, Cincinnati 15, Ohio

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723 New Center Bldg. Detroit 2, Michigan

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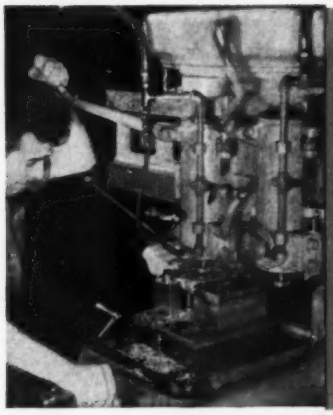
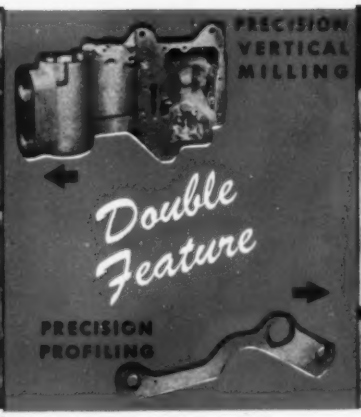


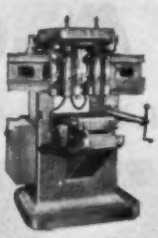


For Toolroom Accuracy on the Production Line

Use Pratt & Whitney Vertical Millers and Profilers

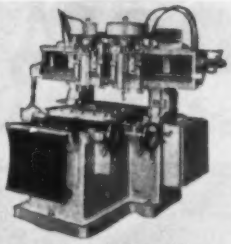
These precision-built machines are specifically designed for the economical production-profiling of irregular-shaped parts requiring accurate interchangeability. Due to their ease of operation and flexibility, they will also outperform other machines on many vertical milling jobs, such as spot milling or facing of small surfaces, hubs, bosses — particularly if they are on different planes or separated by intervening walls.

Rapid, easy operation is assured, not only by the convenient placing of the controls, but also by the free running slides and feed screws, by load compensators, and by the "feel" of the machines which results from effective balancing of the table and spindle head.

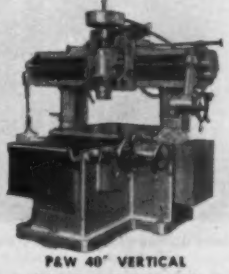


P&W No. 128 VERTICAL MILLER AND PROFILER TABLE WORKING SURFACE 14" x 18"

Made in 3 basic sizes, with either single spindle or two spindle heads. Latter provides for dual profiling, or roughing and finishing in the same setup. Oversize tables and various heights between table and cross-rail can be provided to suit the size and shape of the work to be machined.



P&W 30" VERTICAL MILLER AND PROFILER TABLEWORKING SURFACE 24" x 30"



P&W 40" VERTICAL MILLER AND PROFILER TABLE WORKING SURFACE 36" x 30"

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

Dedicated to Accuracy for 91 years

It will pay you to find out what these Machines can do on your work. Get in touch with any of these convenient P&W Branch Offices.

Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas (The Stanco Co.) • Detroit • Houston (The Stanco Co.) • Los Angeles • New York • Philadelphia • Pittsburgh • Rochester • St. Louis • San Francisco, Export Dept., West Hartford, Conn.

Here, Alco welders help meet production schedules on locomotive frames, vital to defense, by using G-E a-c welders. AC welders eliminate troublesome arc-blow encountered when welding high-tensile steels with d-c equipment.

100% A-C WELDED!

Here's How Alco Produces Road Locomotive Frames with G-E Welders

Shown above are two of the many G-E a-c welders used at Alco.

Corners can be difficult to weld, but the absence of troublesome arc-blow with G-E a-c welders enables this operator to lay an even corner bead in any position.

Diesel-electric road locomotive frames are 100% a-c welded at the Schenectady, N. Y., plant of American Locomotive Company. Alco welding engineers report that General Electric a-c welders eliminate troublesome arc-blow, make for easy striking, cost less than d-c, use less power and are easily maintained.

Like the American Locomotive Company, you may also find that you can speed production by using G-E a-c welders. For example . . .

YOU CAN WELD BETTER WITH AC

You have complete control of the arc in all positions because G-E a-c welders eliminate troublesome arc-blow. This reduces the danger of undercutting and slag inclusions and produces better welds.

YOU CAN WELD FASTER WITH AC

In almost every case you can use higher currents and larger electrodes. That means more footage. Users report increases of 10 to 50%.

YOU CAN WELD AT LOWER COST WITH AC

G-E a-c welders cost less than d-c equipment of the same rating. They use only one-fourth as much power when idling and have much lower load losses. And because there are no rotating parts, maintenance is practically negligible.

SEE YOUR G-E WELDING DISTRIBUTOR!

He's listed in the yellow pages of the telephone directory. Just look for General Electric under "Welding Equipment." Your distributor carries a complete line of welders, accessories and electrodes. General Electric, Schenectady 5, N. Y.

GENERAL ELECTRIC

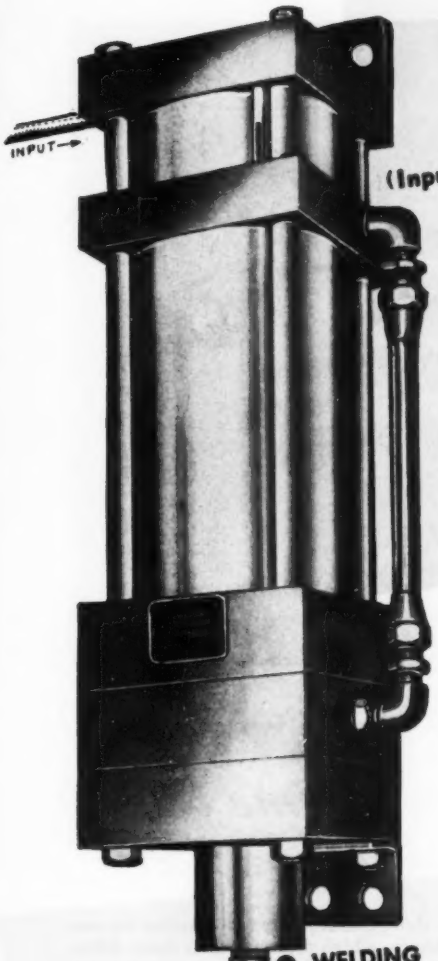
711-17

BOOST
80 PSI AIR

(Input Range: 40 to 3000 psi Air or Fluid)

TO . . .
2000 PSI HYDRAULIC PRESSURE

(Output Range: 200 to 10,000 psi Fluid)



with Miller

Fluid Pressure BOOSTERS

From ordinary plant air line pressure, Miller Boosters produce hydraulic pressures (from 200 to 10,000 psi) for driving one or more hydraulic work cylinders simultaneously at from 30 to 450 strokes per minute. Ordinarily, the booster operates one stroke for each stroke of the operated work cylinders.

Used in place of conventional type hydraulic pumps, Miller Boosters save space and weight, permit convenient portability and are easier and less costly to install, operate, and maintain. Also, they hold pressure *indefinitely —without the motion and heat generation of ordinary pump circuits.*

Used in place of air cylinders, the booster driven hydraulic work cylinder, which can do the work of an air cylinder ten times as large and heavy, saves space and weight at point of application of cylinder thrust—since the booster itself can be mounted separately—away from the hydraulic work cylinder—and either on or off the equipment or machine.

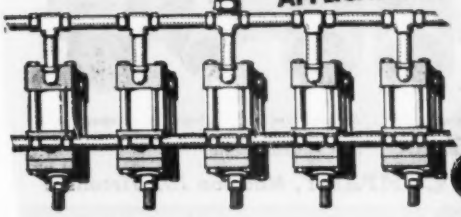
In many installations, the popular Miller Dual Pressure "Air Miser" Booster *saves up to 95% of the air* normally consumed by direct-driven air cylinders.

A wide selection of sizes, pressure ratios and mounting styles are available for the first time at low cost on a normal delivery schedule because Miller Boosters are built up from stock Miller standard cylinder parts to eliminate costly designs, patterns and castings.

Especially Recommended for . . .

- WELDING
- PUNCHING
- SHEARING
- CLAMPING
- RIVETING
- CRIMPING
- PRESSING

and SIMILAR APPLICATIONS



Full Details In Miller Bulletin B-200 Sent FREE On Request

OTHER MILLER PRODUCTS INCLUDE: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES, 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

Miller

MILLER MOTOR COMPANY

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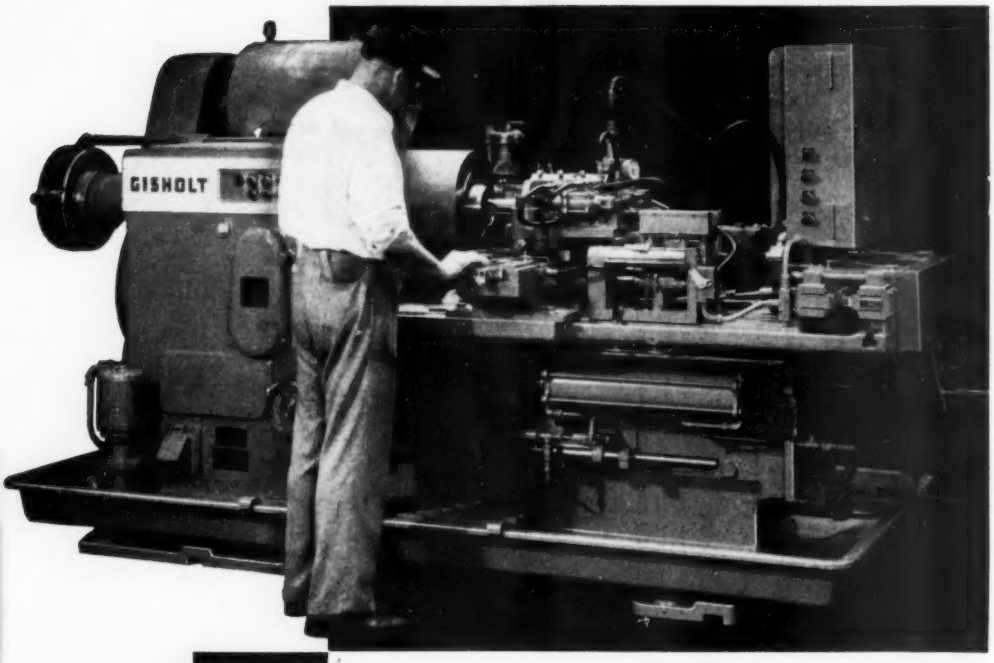
Sales and Service from coast to coast



HOW 8 SIMPLIMATICS

cut machine time 50%
cut man-hours 75%

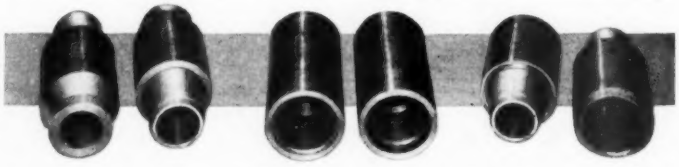
The way you can slash costs with the Gisholt Simplimatic often surprises some of the most experienced production men.

Here's a big shop which found that 8 Simplimatics could take over the job done on 16 other machines. And it takes only 4 operators instead of 16 to turn out the volume of parts required.

Not the least in the cost picture is the machine itself. For the basic Simplimatic design permits you to individualize the machine to a high degree to solve many different problems. Thus, for many jobs you can have all the advantages of a special machine merely with special tooling. Yet it's all done on a Standard Simplimatic—at far lower cost.

The importance of lower costs these days makes it important for you to get all the facts about Simplimatic Automatic Lathes.

The GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*



In producing these tool joint pins and boxes, the 8 Simplimatics work in pairs with fully automatic operation, one man can easily tend two machines.

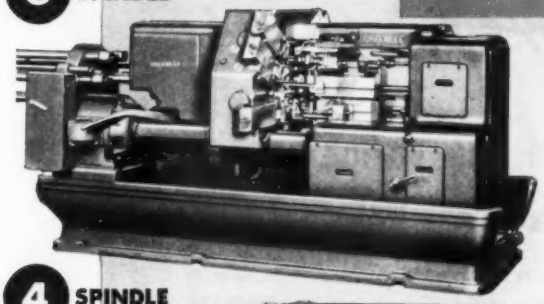
Ask about the many different arrangements possible on the Standard Simplimatics with platen table, vertical head, etc.

GISHOLT MACHINE COMPANY, *Madison 10, Wisconsin*

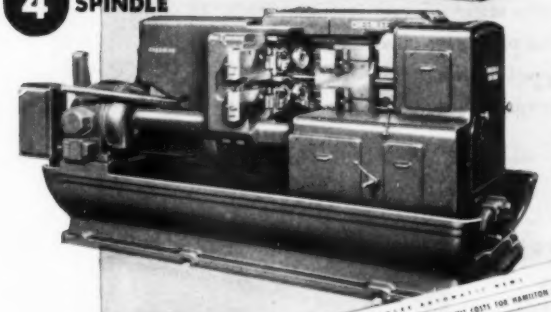
TURRET LATHES • AUTOMATIC LATHES • BALANCERS • SUPERFINISHERS • SPECIAL MACHINES

GREENLEE AUTOMATICS

6 SPINDLE



4 SPINDLE



Maximum economy of operation on long-run jobs, with an uncluttered, easily-reached tooling area that allows rapid and accurate positioning of tools and attachments . . . permitting precise inspection of work finish and tolerances *on the machine.* The Greenlee "Six" is available in 1″, 1-5/8″, and 2″ capacity — the "Four" in 1-5/8″ and 2-5/8″ capacity.

PRODUCTION MACHINERY

GREENLEE

These free monthly issues are written expressly for those of you who are concerned with various phases of automatic screw machine production. They contain practical and informative articles dealing with tooling and maintenance, generously illustrated with drawings and photographs. If you wish your name added to our mailing list, send your request, on company letterhead, to:

The Editor, *Automatic News*

GREENLEE BROS. & CO.
1729 Mason Ave., Rockford, Illinois

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

Continuous, Automatic Cycle produces 1150 parts per hour!

TYPICAL EXAMPLE OF HIGH PRODUCTION ENGINEERED THE *American* WAY

To broach radius notches in automotive piston pins, American engineers designed a ***completely automatic*** two station fixture featuring ***continuous cycling.*** Each station broaches two parts. Installed on an American T-4-24 Broaching Machine, equipped with a special work table, this fixture permits broaching four parts simultaneously . . . produces more than 1150 parts per hour.

SIX AUTOMATIC OPERATIONS ENGINEERED IN CONTINUOUS CYCLE FIXTURE

The operator has only to keep the gravity-type loading hopper filled with parts. A transfer pusher pushes two parts at each station into position where they are hydraulically clamped in V nests. The main slide starts down broaching the four parts simultaneously. At the end of the stroke the transfer pushers push the part into a chute in the center of the machine where they are ejected. The transfer pushers and broaches return to the starting position and the cycle repeats. All operations are electrically interlocked.

SOLVE YOUR BROACHING PROBLEMS THE *American* WAY

Continuous, automatic cycling is only one way that American engineers help manufacturers get high production. Perhaps an American-engineered installation will increase production in your plant. To get American's recommendations send a part print or sample and hourly requirements.

AMERICAN — *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

CARD Ground Thread TAPS

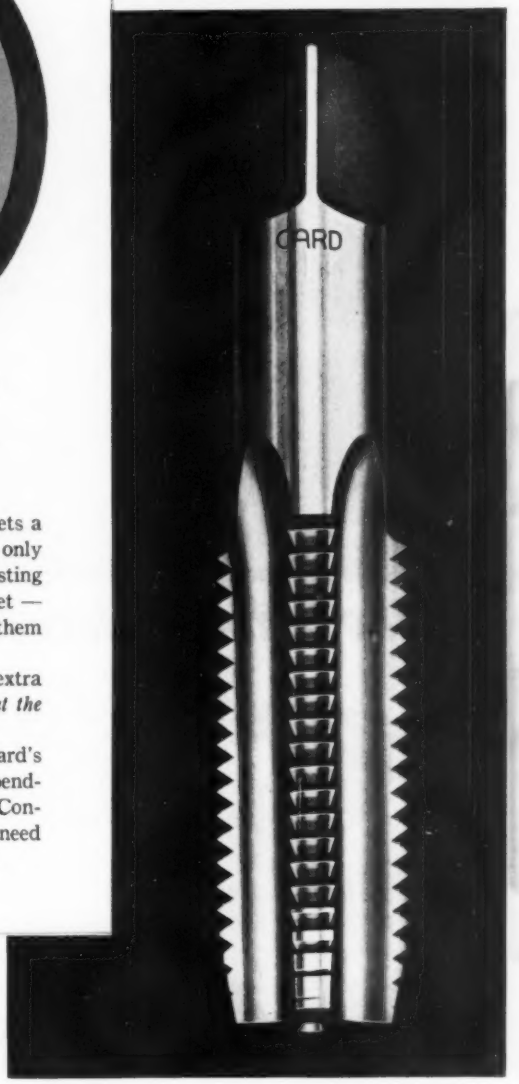
Extra protection... At no extra cost!

Every tap, every cutting tool made by Card gets a rigid factory-inspection. That's routine — but it's only half the story. We also employ the Pittsburgh Testing Laboratory to buy Card Taps on the open market — at places and times unknown to us — and check them again, certifying the results.

This means extra protection for you — at no extra cost. *Because you can buy Card Certified* Taps at the same price you'd pay for run-of-the-mill taps!*

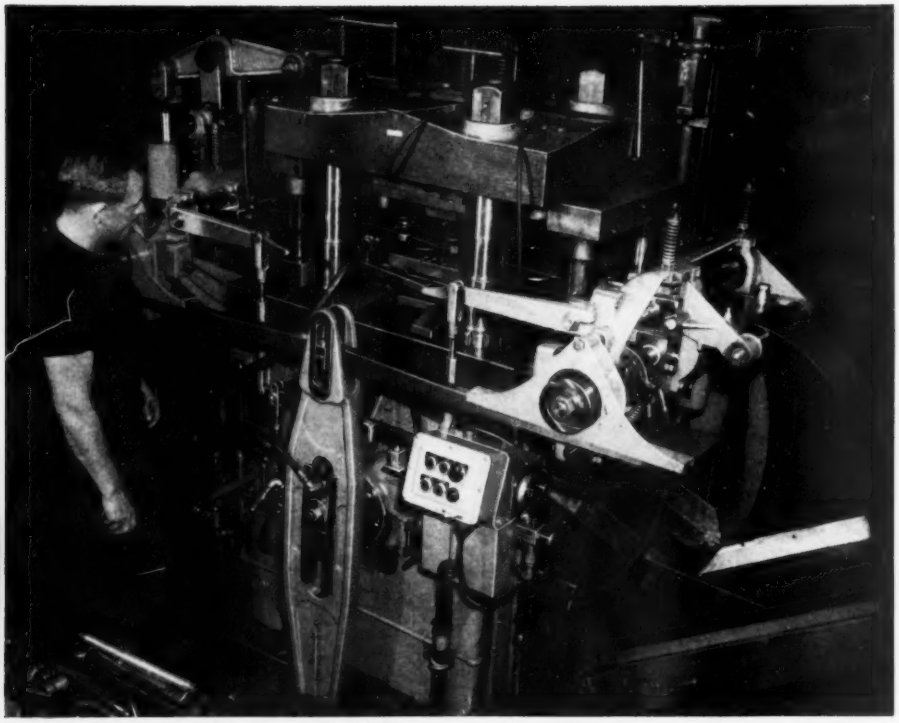
Why be satisfied with anything less than Card's double-checking—with its double assurance of dependability and long, money-saving service life? . . . Contact your Card Distributor for the quality taps you need — and for prompt, cooperative service at all times.

Card Ground Thread Taps are available in both commercial and precision ground threads. When precision ground is required, be sure to specify the limit number.



TAPS
The Certified Cutting Tools*
*by the Pittsburgh Testing Laboratory
Also makers of DIES • SCREW PLATES
DIE STOCKS • TAP WRENCHES

S. W. CARD
MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL CO.



For The Oldberg Manufacturing Company*

which uses Henry & Wright Dieing Machines to produce muffler parts such as oval outerheads, oval innerheads, three-pass innerheads and cones. Oldberg, like other leading companies who know the score, rely on Henry & Wright Dieing Machines to slam a cover on rising production costs. These compact, precise, metal-fabricating wonder workers swing at costs with a two-fisted attack. And what a licking these costs take. They just can't stand up to the one-two combination of high speed and long die life delivered by Henry & Wright machines.

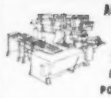
*Subsidiary of The AP Parts Corporation, Toledo, Ohio, manufacturers of: Mufflers, Pipes, Miracle Power, DGF 123.

Only the best is

OTHER EMHART PRODUCTS INCLUDE:

GLASS MAKING MACHINES

HARTFORD-EMPIRE CO.
Division of Emhart Mfg. Co.
HARTFORD 2, CONNECTICUT



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Division of Emhart Mfg. Co.
PORTLAND, CONNECTICUT

PLASTIC BOTTLES, RODS, TUBES, SPECIAL SHAPES

PLAX CORPORATION
Subsidiary of Emhart Mfg. Co.
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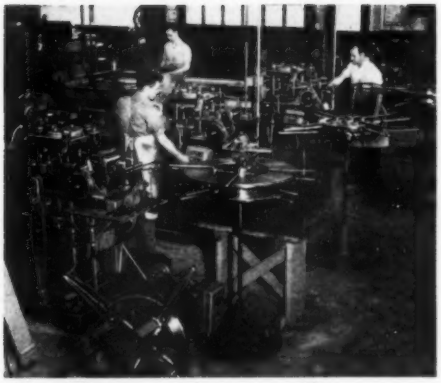
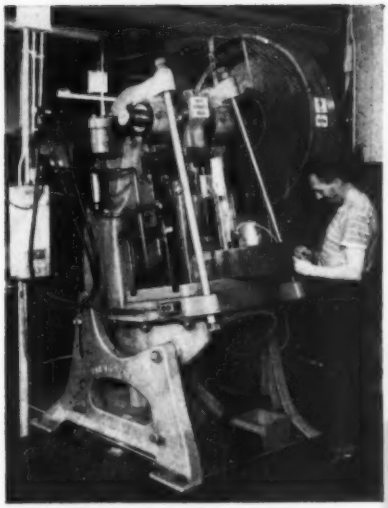


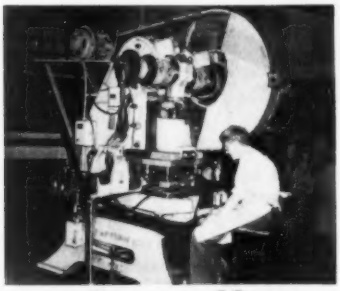
For Barber-Colman Company

where Henry & Wright Dieing Machines are "an important contributor to the production of many of our products, particularly our Uni-flo Air Distribution Outlets." Above 25-ton units are piercing, folding and cutting off strips of grill material to predetermined lengths.



For Gillette

where 10-, 25-, and 50-ton V & O presses are used. Above 50-ton machine forms the cap for the Gillette one-piece razor at production rates of approximately 4,000 parts per hour. Engineered for close tolerance work, V & O presses are preferred by companies making precision-built products.



For International Business Machines

which uses V & O presses for numerous precision parts. The above V & O press is producing an armature for relay assembly out of coiled, cold-rolled electrical iron. Five working stations are used. The part is trimmed, pierced with two holes, finish blanked, and offset at one end. In the final working position, two ears are bent up and a second offset is formed.

HENRY & WRIGHT
DIVISION OF EMHART MFG. CO.

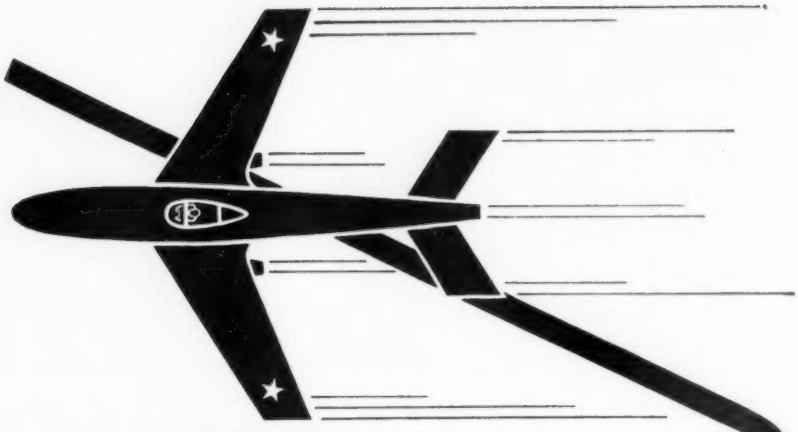
THE V & O PRESS CO.
DIVISION OF EMHART MFG. CO.

good enough

FACT PACKED CATALOGS

Catalogs containing complete specifications and operating details are available. Please write The V & O Press Company, Hudson, N. Y.

Complete descriptions of all Henry & Wright Dieing Machines. Write: Henry & Wright, 483 Windsor St., Hartford, Conn.



TUF-STUF'S best proving ground is in the air!

It pays to specify *TUF-STUF* aluminum bronze alloys for parts that must stand up

● Because they are both light and tough, TUF-STUF aluminum bronze alloys have proven invaluable in America's aircraft as valve-seat inserts, spark plug inserts, valve guides, gears and other vital parts.

If your product requires machined parts that are strong but light, resistant to corrosion, long wearing and resistant to oxidation even at high temperatures, then TUF-STUF is the right alloy for the job.

TUF-STUF alloys are furnished in the form of forgings, rods and screw machine parts. They fill Federal Specification QQ-B-666, Grade B, and several other variations. Because of the increased use and demand for both aluminum and copper, jobs carrying a Defense Order Number are receiving first consideration.

MUELLER BRASS CO.

PORT HURON 18, MICHIGAN

61

How CARBOLOY Service can help you...

Conserve Carbide Sheet-Metal Dies

Die Engineering Manual D-124

All the facts on how to finish and service your vital carbide sheet-metal dies for longer die life, fewer rejects, better finish, closer tolerances, and lower costs. Send the coupon today for your free copy.

Die Engineering Service

Trouble-shooting Carboloy Field Engineers often can come up with valuable suggestions for increasing production, conserving dies. Contact your local Carboloy Field Engineer or mail coupon for this free service.

Die Training School

Specialized courses in finishing and servicing carbide dies for extra life are available to your die-room personnel at the Carboloy Customer Training School in Detroit. Check coupon.

Boost Cartridge Case Output

The Carboloy organization has the top-quality dies, the complete services and the practical World War II experience to help you get *maximum efficiency* in producing cartridge cases for small arms and larger sizes.

Carbide dies outwear steel dies many times, are essential for the high production of brass cartridge cases and a must for the production of steel cartridge cases. The Carboloy organization, world's largest manufacturer of cemented carbides, can furnish any size carbide die for both steel and brass for drawing, tapering and shouldering.

Our Field Engineers and skilled plant personnel, armed with valuable experience from the last war and facts on latest die applications, will tackle your special production problems. And the Die Training School (described above) can train your die men in the care and service of large and small dies for longer life.

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

Get all the details on Carboloy Die and Customer Services.

FILL OUT THE COUPON . . . MAIL IT TODAY!

SPECIFY

CARBOLOY®
CEMENTED CARBIDE

CARBOLOY DEPARTMENT
of General Electric Company
11149 E. 8 Mile Blvd., Detroit 32, Michigan

We are interested in your dies and services for producing _____.

Please send information on

☐ Die Training School ☐ Die Manual D-124 ☐ Die Engineering Service

Name _____ Position _____

Company _____ Address _____

City _____ Zone _____ State _____

Announcing the new SIP jig boring and *milling* machine

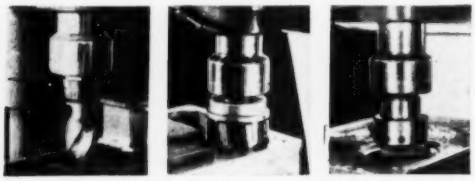
Hydroptic-6

with viewing screens

for table and spindle head settings

OUTSTANDING ADVANTAGES :

1. **Exceptionally rapid co-ordinate settings** on the magnified image of the built-in standard scales.
2. **Powerful spindle head** incorporating a self-contained drive and a spindle mounted at the nose in double taper roller bearings.
3. **Large free distances** between uprights and between table top and spindle end.



For Further Information
Send for our bulletin No. 1036a

SPECIFICATION

Working range	40 in. × 28 in.
Table working surface	43 1/4 in. × 33 in.
Maximum distance from table top to spindle end	35 1/2 in.
Free space between uprights	43 1/4 in.
Hydraulic feeds	from 12 in. to 100 in./min.
Spindle internal taper	Morse No. 4
18 speeds	from 40 to 2000 r.p.m.
Spindle quill travel	10 in.
Boring capacity	12 in.
Graduation of standard scales built into the work-table and the spindle head saddle	0.1 in.
Size of viewing screens	9/16 in. × 2 7/16 in.
Reading on external auxiliary scales	0.1 in.
Reading on screen micrometer drums	dial 0.001 in. / vernier 0.0001 in.

Guaranteed setting accuracy: .00015in.

AMERICAN SIP CORPORATION

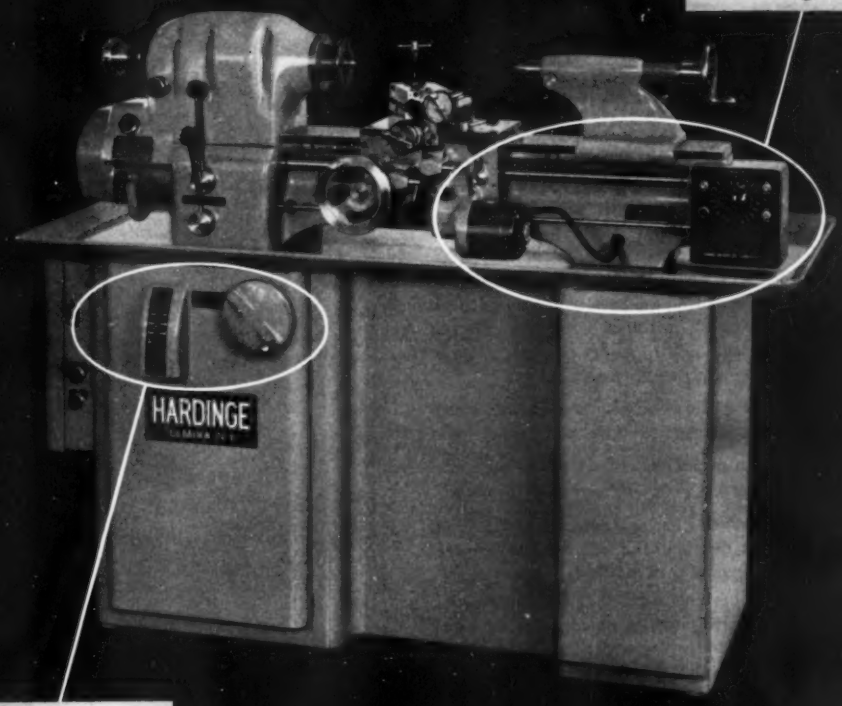
HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N. Y.

Infinite Control of Speed and Feed

is a feature of the HARDINGE ELMIRA, N.Y.

Tool Room and Production Lathe



Both drives are independent and infinitely variable to secure every possible combination of speeds and feeds within the following range:

Variable Speeds: 125 to 3100 r.p.m.
Variable Feeds: ¼" to 7" per minute

Write HARDINGE *for Bulletin HLV*

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Offices in principal cities. Export office 269 Lafayette St., New York 12, N. Y.

Backstand Method Saves Time!

Coan Mfg. Co. triples number of steel guides sanded in one hour

problem: The Coan Mfg. Co., in Madison, Wisconsin, used set-up wheels to sand the beveled edges of a steel guide for vending machines. Using this method they could sand only 10 guides per hour . . . too long and too costly an operation.

solution: The Coan Mfg. Co. switched from the set-up wheel to the backstand belt method for this finishing job.

result: They used an Armour Abrasive Belt and were able to sand 30 guides per hour . . . *tripling production!*

Manufacturers of hundreds of different industrial and consumer items have proved that the backstand belt method is more efficient and more economical than the set-up wheel.

If you are grinding, polishing or finishing flat or contoured surfaces, cast pieces, stamped pieces or forged pieces, the backstand method can help you with your production problems.

To learn more about the many advantages of the backstand belt method, write today for our free booklet.

We recommend buying through your industrial distributor

MAIL THIS COUPON TODAY

Please send me the booklet "Facts about Backstand Belt Grinding and Polishing."

Name .....

Title .....

Firm .....

Address .....

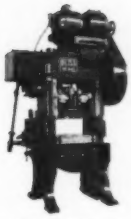
City ..... *Zone* ..... *State* .....

Armour's abrasive belts are only part of a complete line of abrasives built to rigid quality specifications. There are sheets, rolls, discs and other more specialized shapes.

ARMOUR *Coated Abrasives Division*

SHEETS • ROLLS • BELTS • DISCS

Armour and Company • North Benton Road • Alliance, Ohio



High Production

Toggle Drawing

Coining and Embossing

Hobbing

Double Crank

FROM THE RIGHT PRESS FOR A GIVEN JOB TO A COMPLETE PRESS ROOM... It's Bliss!

There can be only one *right* press for a given job. When all factors are weighed: cost...quality of stampings...maintenance...adaptability—one will emerge as the *right* press.

It's logical to call on Bliss for press recommendations because:

Bliss builds more types of presses—mechanical and hydraulic—than any other company in the world.

Bliss builds the full range of automatic feeding, indexing and ejecting devices to obtain the maximum press output.

Bliss has the engineering experience—over 90 years of it—in designing equipment for the forming, drawing and extrusion of steel, copper and brass...for light and powdered metals.

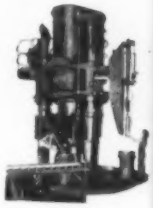
Whether it's a single press for a given job or a complete stamping plant, Bliss engineers welcome your inquiry. They will help you on methods, production rates and costs without obligation.

E. W. BLISS COMPANY

CANTON, OHIO

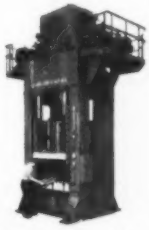
Die Spotter

Single Crank

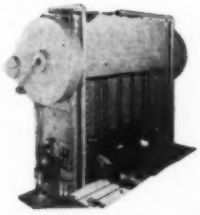


Heading

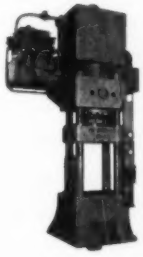
Inclinable



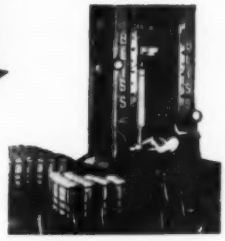
Double-action Hydraulic



Rail Forming

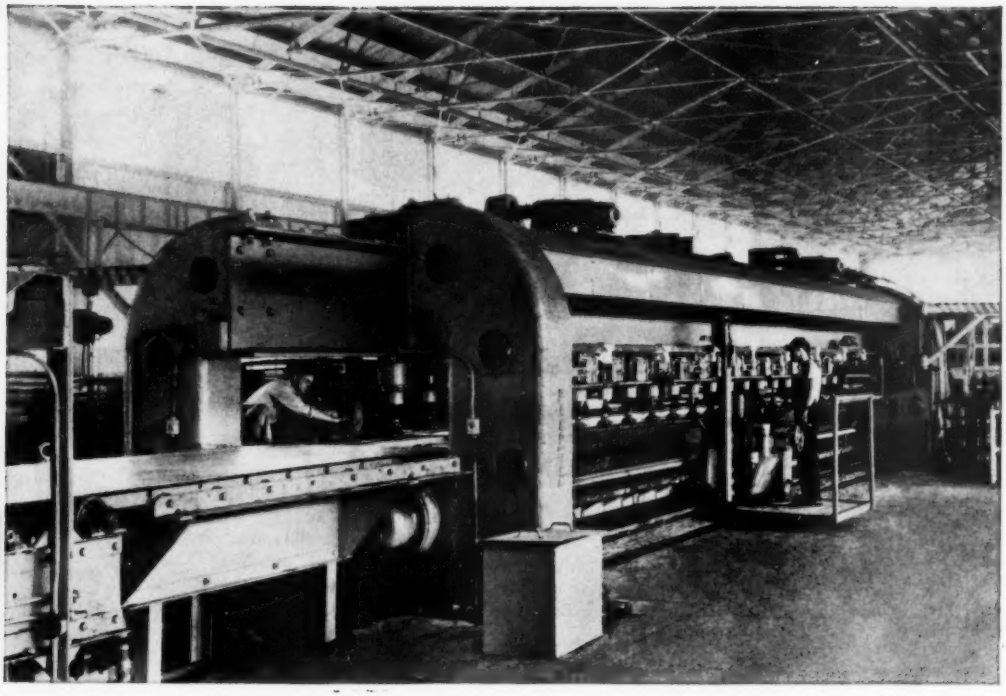


Hydraulic Open Rod



Hydraulic Redraw

BLISS ON YOUR PRESS IS MORE THAN A NAME...IT'S A GUARANTEE



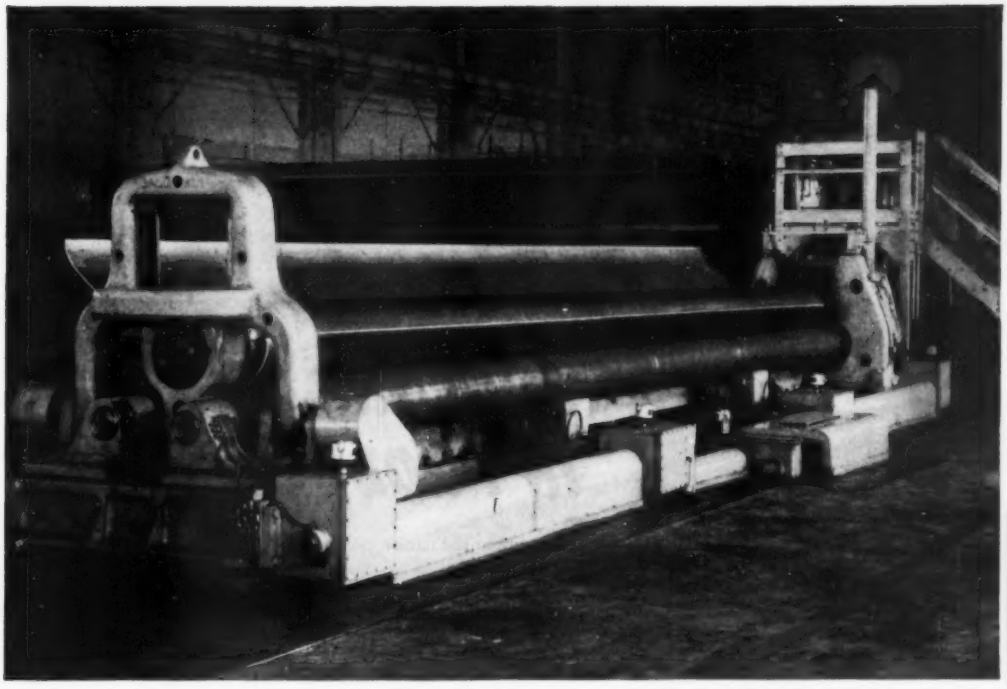
LARGE PIPE & LOTS OF IT with BALDWIN equipment

Spotted at vital points in the production line, Baldwin Plate Planers and Baldwin Bending Rolls are helping five of the nation's largest producers to blaze new trails in applying assembly-line methods to pipe manufacture.

As illustrated above, the Baldwin Plate Planers are arranged in pairs, properly spaced to machine both edges of the skelp simultaneously. Separation can be varied, to accommodate different widths. The material then progresses to a large Baldwin bending roll, where it is converted to cylindrical form ready for welding. Daily production is measured in miles.

Baldwin Plate Planers and Bending Rolls are also serving in the plants of other leading pipe producers. One of their biggest advantages is the fact that they lend themselves perfectly to specialized operations such as these . . . and at any time can be assigned to jobbing operations, where they produce with equal efficiency.

5813



BALDWIN EQUIPMENT OFFERS THESE FEATURES

BALDWIN plate planers

Soundly engineered and precision built, with "custom-built" features including:

- Group Control of all work-clamping cylinders.
- Shielding of carriage screws from dirt, scrap or dropped tools.
- Anti-friction thrust bearings . . . drive design keeps screw in tension during planing.
- Continuous lubrication.
- Allowance for overrun in event of electrical failure.
- Main operating controls within easy operator reach.

Ask for Bulletin 190 for added details.

BALDWIN bending rolls

Designed primarily for heavy duty operation—noted for rugged construction and operating efficiency. Either standard or special units, offering these advanced engineering features:

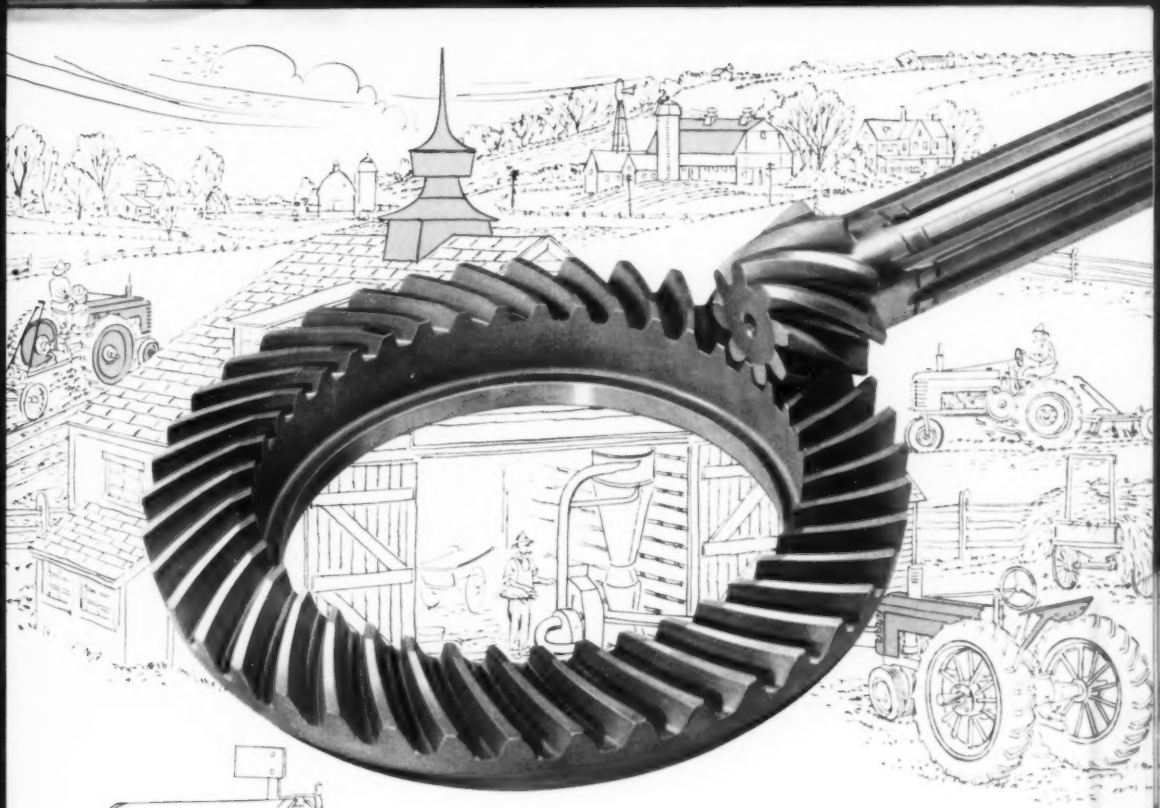
- All forces and reactions largely absorbed within members in which they originate.
- Cut-steel spur type driving gears, shielded for safety and to protect against dirt.
- Drive bearings cast as an integral part of gear case, assuring alignment accuracy.
- Positive, precise controls—operator has full view of work.

Ask for Bulletin 278 for more information.

BALDWIN-LIMA-HAMILTON CORPORATION
Philadelphia 42, Pa.
Offices In Principal Cities

BALDWIN - LIMA - HAMILTON

MADE TO TAKE THE WORST...
GIVE THE BEST IN PRODUCTION
Throughout the nation on the most grueling drives Atlas Roller Chain has been torture-tested. Proved its ability to take the worst in severe service and deliver the best.
Atlas Roller Chain is made to provide more production. It assures positive sprocket grip which makes possible the delivery of full rated horsepower without slippage or friction. Your machines can run at full rated speeds and give greater output.
Atlas Roller Chain is built for less maintenance. Bushings and pins are case hardened by the Atlas Nicarb Process which provides greater inherent strength. Link plates and rollers are made of tough, heat-treated alloy steel. Result . . . better chain performance . . . less chain maintenance.
For maximum production, plus long, trouble-free service, install Atlas Roller Chain. Available through leading industrial distributors from coast to coast. Write today for new Atlas handbook and catalog on roller chain.
ATLAS CHAIN & MANUFACTURING CO.
PHILADELPHIA 24, PENNA.
ATLAS
ROLLER CHAIN



Reliable Food Delivery

The enormous food production of rural America is made possible by farm machinery—machinery that multiplies man power and old fashioned horsepower many, many times.

Many makers of farm machinery use "Double Diamond" Gears. This is particularly true of tractors. Making spiral bevels for leading tractor manufacturers is one of our biggest and most satisfying jobs. Big because of the volume of work entrusted to us. Satisfying because it contributes in small part to the success of the nation's mightiest enterprise—the American farm.

IMPORTANT NOTICE TO PRESENT AND FUTURE CUSTOMERS

During the present abnormal period Automotive Gear Works believes its first loyalties are due its present customers, many of whom are directly or indirectly in defense work. For that reason, every effort will be made to first satisfy the growing requirements of those companies who are already users of "Double Diamond" Gears. Where facilities or materials permit, the requirements of prospective customers will receive careful attention, and technical assistance will continue to be made available for the solution of gear problems regardless of whether or not we are now in a position to build the gears recommended.

DOUBLE DIAMOND TRADE MARK GEARS

AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

Reg. U. S. Pat. Off.

Take a Heavy Cut Off Your Backlog...

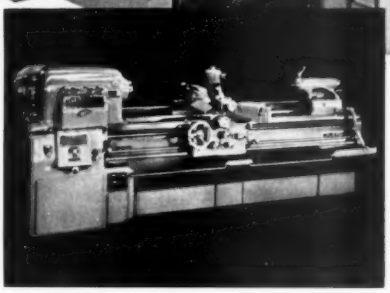
With Monarch Tracer Controls

Increased output within your present plant limitations is the quickest answer to today's demands—increased output as provided by Monarch tracer-controlled single point turning. Most new Monarch lathes can be equipped with one of the *three* types of Monarch tracer controls best suited to get this result.

Look at these actual job records! On a rotary grinder casing formerly turned on a turret lathe—*machining time cut* from over 22 minutes to 6. On a rear wheel spindle, formerly produced in over 2½ minutes on 2 machines (one roughing and one finishing)—*machining time cut* to 24 seconds on a single Mona-Matic. On an aircraft engine mount, *machining time cut* from 47 minutes to 20 minutes, with 6 separate operations eliminated and accuracy and finish improved. On a 120" printing press roll, *turning time cut* from 7½ hours to 1½ hours.

You'll notice that we're talking increased output. Isn't the decreased cost obvious? And isn't this the equivalent of adding to your floor space? You can read all these into your production figures. Bear in mind that with the easily set up tracer controlled principle, you can realize all three advantages on short runs as well as long ones.

This is certainly the time to investigate production improvements like these. We'll gladly answer your inquiry with complete data, job facts, descriptions . . . *The Monarch Machine Tool Co., Sidney, Ohio.*



Monarch Series 60 Engine Lathe with Air-Gage Tracer Controls. For turning multiple diameter shafts and turning, boring or facing contours. Available with or without fully automatic cycle. Monarch has built fine lathes since 1909—3 types of tracer controls beginning in 1930.

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

Wire Trouble?

When wire twists and tangles as it uncoils, you lose production time. That's why Chase mills pay so much attention to the "cast" of Chase copper alloy wire. Uniformity of temper and stress makes Chase wire conform to the shape of the coil and unwind smoothly.

It is free from physical defects . . . uniform in gauge, texture and color. For cold-heading, Chase wire is tops. Write for folder "Chase Cold-Heading Extruded Brass and Copper Alloy Wire."

"DO" orders: Our metallurgical engineers are familiar with military specifications for brass and copper for ordnance components, and will be glad to consult with you on the selection of these metals for defense orders.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

CHASE 75th ANNIVERSARY 1876 1951

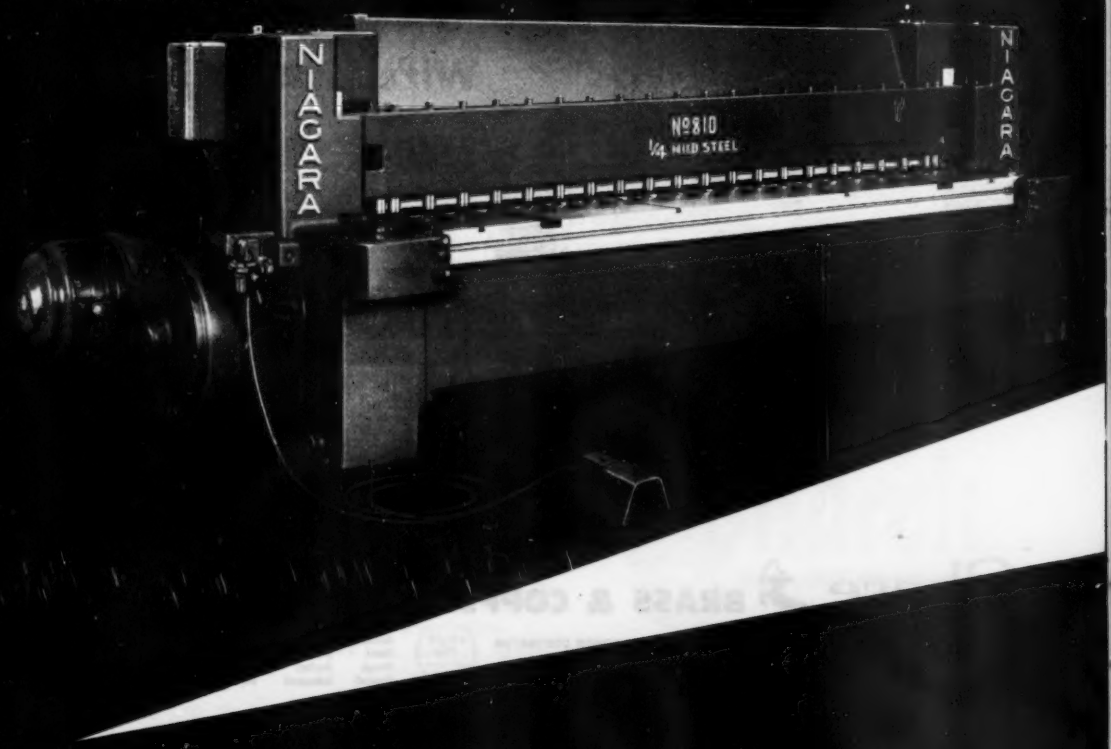
• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†Sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

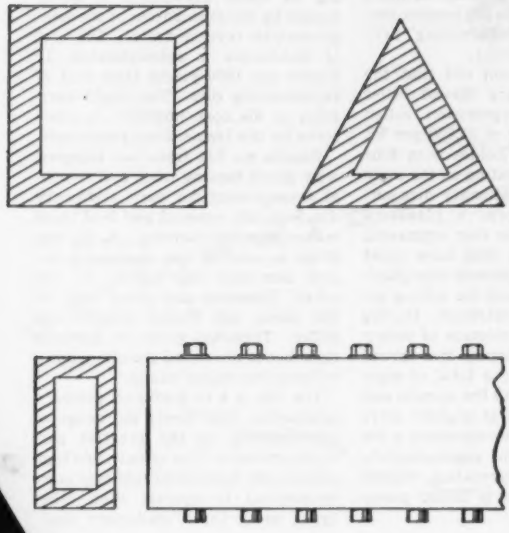
NIAGARA

Accuracy in a squaring shear is dependent on rigidity of the shear's components and not upon any individual feature. Sturdiness, convenience, speed and dependability are the result of experienced engineering and superb manufacture.

Latest type Niagara No. 810 Power Squaring Shear. Arranged with electro pneumatic tripping device operated by foot switch.



BASIC SHEAR DESIGN Results in Accurate Cutting



● BED, CROSSHEAD, HOLDDOWN and HOUSINGS in NIAGARA UNDERDRIVE SHEARS are box sections to resist with minimum deflection the horizontal, vertical, diagonal or torsional stresses to which every shear is subjected. No other section will do the job as efficiently. This construction results in extreme strength and rigidity without resorting to deep beam sections which, in the bed, necessarily project below the floor line.

The simple, mechanically operated holddown having individual self compensating pressure feet, performs all required functions of a good holddown efficiently, effectively and quietly without using complex hydraulic circuits, pumps, valves, packings, cylinders, etc. and without generating heat. Maintenance costs are held to a minimum.

The drive is thru efficient spur gears mounted on anti-friction bearings and running in oil. It employs the famous Niagara 14 point instant engaging sleeve clutch. There are no sliding surfaces such as in worm gears and friction clutches to consume power, generate heat, and to wear rapidly.

For Your Defense Production

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

TRY THIS *cost-cutting team* **for CARBIDE GRINDING**

Wickman Steel-Bonded Diamond Wheels practically indestructible with extra long life. Diamond particles stay in place until completely worn. Finish tools better for longer tool life.

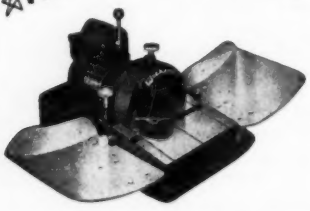
Wickman Resinoid-Bonded Diamond Wheels for faster and freer carbide cutting and less frequent wheel dressing.

Wickman Chip-Breaker Diamond Wheels steel-bonded for much longer life than other chip-breaker diamond wheels. Reduce wheel and tool costs materially and speed grinding 3-4 times.

Complete facts in free 52-page catalog.

Grinding with Diamond or Abrasive Wheels is

☆FAST! ☆ECONOMICAL!

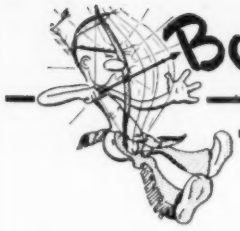


on the Wickman GF-2-A

With 1 HP reversible motor and impeller-type 12 gph coolant pump, this heavy bench grinder delivers fast, economical grinding with both silicon carbide abrasive wheels and Wickman steel-bonded diamond wheels. Wheel guards and splash protectors, three position table for wheel wear adjustment, plus a protractor slot for angular grinding, make this the ideal grinder for all off-hand grinding around the shop.

Delivery From Stock. Send for bulletin.

THE Wickman MANUFACTURING CO.
15533 Woodrow Wilson Ave.
DETROIT 3, MICHIGAN



Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Threading Complaint

Our client, the D. H. Prutton Machinery Co., Cleveland, is very much dissatisfied with the brief mention accorded the Prutton Rollmaster machine in your "Roll Threading" article (*AM* July 9, 1951).

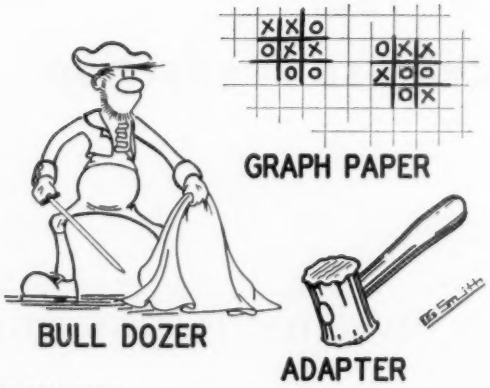
They wish to point out that the Rollmaster planetary thread roller will produce high-precision rolled threads at the rate of 25,000 per hr, using a rotary die holder with four segmental dies operating on the main spindle, and two stationary dies surrounding it to form a planetary threading path. The four segmental and two stationary dies have relief at both ends. This permits easy starting of the blank, and the rolling action of gradual penetration. During each cycle (a full rotation of rotary die) the four segmental dies thread two blanks, making a total of eight parts per cycle. With the spindle and die holder rotating at slightly more than 52 rpm (which represents a die surface of 164 fpm, approximately the same as reciprocating thread rollers) the output is 25,000 pieces per hr.

Reciprocating thread rollers have a forward and reverse travel in each cycle that threads only one blank. The Rollmaster begins with two blanks at the start of cycle, and threads six more blanks before ending its cycle. Production is quadrupled by the elimination of the nonproductive reverse travel. Die cost of Rollmaster is approximately 1¢ higher per 1000 pieces than that of reciprocating dies. The slight variation of die cost, however, is overcome by the tremendous production.

Blanks are fed from two hoppers, with direct-feeding track and removal arrangement for each stationary die. Separate removal and feed track makes possible running. R. H. machine screws on one stationary die and hex-head cap screws on the other. Diameter and pitch must be the same, but thread lengths can differ. Threaded parts of different style heads are rolled simultaneously without becoming mixed.

Die life is 3 to 5 million pieces, a production that meets the range of practicability in the greatest part of the industry. Use of only two hoppers on the Rollmaster makes it more economical to operate than other types using three stationary dies.

.....GRINETICS..... *BY D. G. SMITH*



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IF YOU USE

honing abrasives

WE GIVE YOU—

We stock and process all types of abrasive sticks manufactured by the three largest, best equipped and most experienced abrasive manufacturers in America. You have your choice:

THE CARBORUNDUM COMPANY

THE NORTON COMPANY

THE BAY STATE ABRASIVE PRODUCTS COMPANY

We maintain four processing plants and warehouses:

We assume full responsibility for the results obtained with your honing equipment. As the principal manufacturer of honing equipment for over twenty years we have a large, experienced staff of Honing Engineers and Service Technicians. The accumulated know-how of this organization plus the technicians of the three abrasive companies are at your service when you BUY MICROMATIC HONING ABRASIVES.

BUY MICROMATIC HONING ABRASIVES

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 4, MICHIGAN

District Field Offices: 1323 S. Santa Fe Avenue, Los Angeles 21, California • 206 S. Main Street, Rockford, Illinois • 231 S. Pendleton Avenue, Pendleton, Indiana • MICRO-MOLD Manufacturing Division, Boston Post Road, Guilford, Connecticut • 55 George Street, Brantford, Ontario, Canada

Write for your copy of Cross Hatch on MICROHONING ABRASIVES

for permanent serial numbering

Noblewest automatic numbering heads are a product of long experience. They are well-known for their dependability and long life wherever *permanent* serial numbering is required on steel and other metals, wood, fibre, hard rubber and plastics. Numbers are automatically advanced. Can be used in either marking presses or roll-marking machines. Applications include numbering on nameplates, machines and component parts. Noblewest numbering heads also furnish a direct reading at all times of the *exact* number of pieces marked—a valuable aid to production control.

STANDARD MODEL (at bottom of illustration) for serial numbering. Can be furnished in any size of numbers and with special characters as needed.

SPECIAL MODELS can be made in combination with dies (top of illustration) and to any other requirements including embossing and debossing heads. For prices write Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Connecticut.

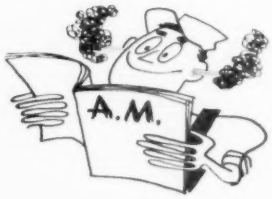
MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

Loading the threading path with three stationary dies increases production by one blank per cycle. Three stationary dies require three hoppers, extra feed track, etc., an increase in cost of equipment that is not worth the benefit of extra blank when considering that parts to be threaded must be sufficient in quantity to absorb cost of dies and equipment.

Nicholas Masso
Cleveland



Safety Valve

I sincerely wish that a copy of "Whose Idea?" (*AM*, July 23, 1951) could be printed in big red letters and nailed to our works manager's wall. He spent over $500 for an educational course for his supervisors and staff officers; yet to the best of my knowledge he has blocked every single suggestion offered, based on that course. I sympathize with the "one-plant town," and the "man who owns his home or has kids in school," as I qualify on all three counts and realize the situation's unpleasant aspects.

Your magazine is probably the most satisfying outlet for surplus energy which I have yet seen. If I have an idea, try it out and know it works, and yet see it kept from general adoption thru damphuliness, it does my heart good to see it in print in Practical Ideas. At least, this is tangible proof of my idea production and would stand me in good stead if I ever took off for the big city.

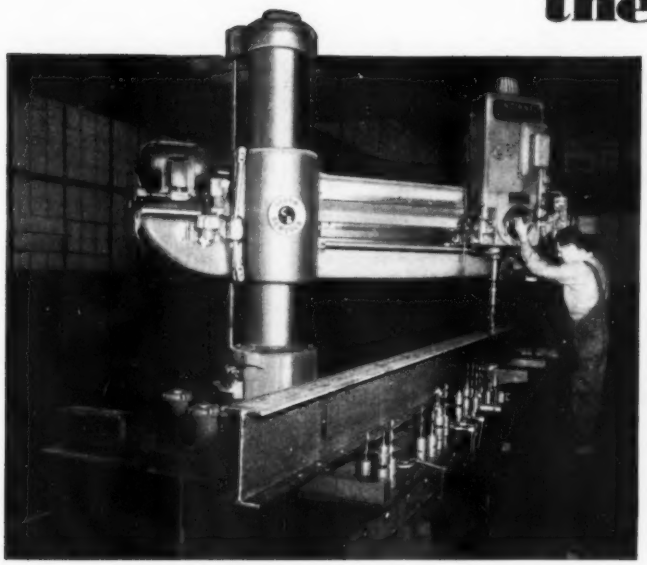
Name Witheld.

Round Table

One feature of *AM* which I have always enjoyed is your Round Table. You have discussions of earlier topics, which is a good idea. Wouldn't it be better to publish discussions or general opinions on the current subject in the same issue? When one finds a particular Round Table that is interesting, one would like to have other people's opinions at that time, not in some future issue.

Would also like to comment on

the LONG



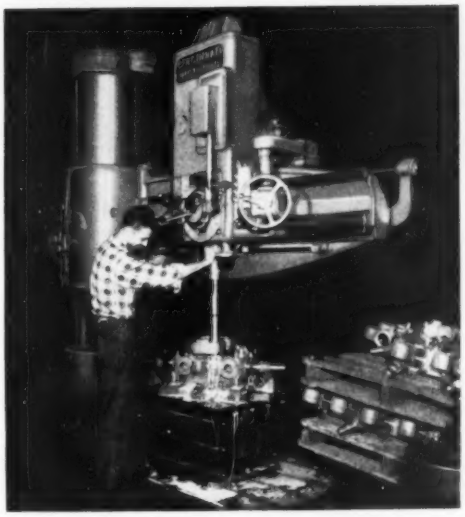
Various holes are being drilled and tapped in long "I" beams on this 8' arm 19" diameter column SUPER SERVICE Radial Drilling Machine, mounted on a track type base, at the plant of the Euclid Road Machinery Company, Euclid, Ohio.

The unusually heavy construction of this base, together with hardened steel wheels which travel on 80 pound, 56 guage rails, provides the necessary strength in the proper position to help manufacture the parts of the framework for some of the largest road machinery in the world.

and SHORT jobs

For lighter machines, a similar smaller base machine, 36" gauge using 40 pound rails is available. Power traverse, as well as equalized power clamping to the rails is by individual electric motors which are protected by electrical interlock. All these motors are conveniently controlled by push button at the head of the machine.

To handle the usual small jobs, the Euclid Road Machinery Company, also have many SUPER SERVICE Radial Drills with the standard type base. This 6' arm 19" diameter column SUPER SERVICE Radial is handling their many small parts profitably.



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RADIAL AND UPRIGHT DRILLING MACHINES
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Radials 7½" dia. col., 2½' arm, to 26' dia. col., 12' arm.
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For further information on SUPER SERVICE Radial Drills, write for Booklet R-29.

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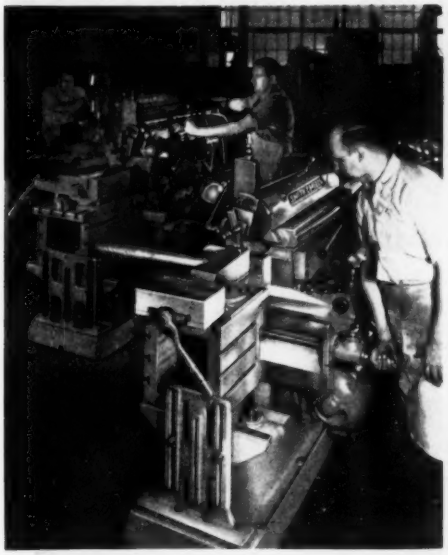
"forges" ahead

with 8

Smith & Mills Shapers



Shaping hi-chrome tool steel, forging manufacturer notes "time savings and convenience" over 22 years service.

The time saving features of fast return, rapid traverse and the convenient arrangement of controls are among the Smith and Mills Shaper advantages commented upon by this satisfied user of the "Patented Ram" Shaper.

Of a battery of eight shapers in this plant, four are used in making drop forging trimmers from high chrome tool steel. The balance of the shapers are employed in general tool and die work on steels ranging from 18 to 42 Rockwell C.

On heavy duty work such as this, one of these shapers has been in operation more than 22 years . . . three of them for more than 15 years, with no major parts replacement and with a minimum of maintenance.

The speed, versatility and ease of operation of Smith and Mills Shapers will pay in your plant . . . as it does for this noted manufacturer. Available in 10 sizes ranging from 12" to 36" . . . plain or universal types . . . Economy, Standard and Heavy Duty Patterns. For additional details on all the profit features offered by Smith and Mills Shapers, write to Department AM-9.

SMITH & MILLS SHAPERS, Inc.

DIVISION OF HAMILTON THOMAS CORP. HAMILTON, OHIO

the excellent series of articles "Good Carburizing Practice" by Frischman. It might be desirable to reprint these in booklet form, as they should be useful in training programs.

H. J. Bates
Lafayette, Ind.

Reader's comments on Round Table are spontaneous and genuine, not made up by the editors. Hence they cannot be published until after the article has appeared, been read, and letters, pro and con, been written and received. Frequently, letters come from remote parts of the world, weeks or months after the publication of a particular item. To solicit comments before publication would destroy their spontaneity.

Regarding the Frischman articles, the author is planning to publish them in book form in the near future.—ED.

Give Youth a Chance

You have published quite a few letters from people who agree with Fred Colvin that a man should not be retired at 65, but I notice they are all from men who are pretty close to the dangerline. If you're not getting sick of the subject, may I put in a word for us young fellows. The old-timers like to talk about their accumulated wisdom, but all too often it is the wisdom of twenty years ago, and most of them are so set in their ways that they resist all modern methods.

Get rid of the old men, and give us younger men a chance. In our late forties and early fifties, we have accumulated a lot of experience, too. And what's more it is up to date. We are at the peak of our powers now; let us have the top positions until we are 65, and we'll have made enough money and be glad to retire to make room for the next crop of youngsters on their way up.

I know it's tough for the first group that have to go, but once you have got the cycle started, each group, in turn, will retire automatically upon reaching 65, after several years in the saddle, and will be glad to take a rest.

H. Waring
Chicago

J&L STEEL

SUN MON TUES WED THURS FRI SAT
1 2 3 4 5 6
7 8 9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28 29 30
SET A Scrap Day IN YOUR ORGANIZATION!

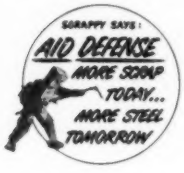
Set a definite day . . . soon . . . to start rounding up all the dormant scrap in your operation. Extra scrap is urgently needed to keep mills at expanded steel production.

Here's what's wanted

Steel producers must have scrap over and above the "working scrap" that you normally sell. Broken or obsolete machinery and equipment . . . odds and ends . . . worn out parts—in fact, *all* the iron or steel material that's rusting away in your plant or operation. Get it out of the way . . . get it on its way into production.

Here's what to do

Set a definite day to start . . . make scrap collection the definite responsibility of one man or one group. Call your scrap dealer. He'll take all the scrap you can collect and pay you well for it.



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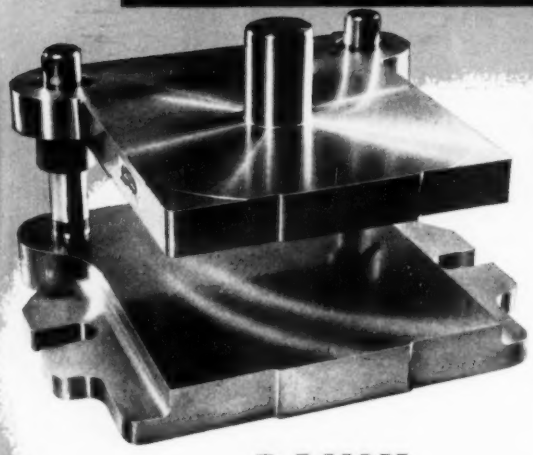

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SPOT NEWS of Metalworking

- **A new polish for aluminum, called Raco 220, is being used on aircraft parts** without thinning out the pure aluminum coating over the dural base alloy. Developed by Ryan Aeronautical Co., the polish gives a "roller bearing" action on the surface to be polished without grinding into it. Polish contains 4 lb of 400-mesh silica to the gallon, suspended in a water solution, is applied by cloth pre-dampened with water.

- **Northrop Aircraft has licensed Turco Products, Inc.,** Los Angeles, to make and market all materials used in Dy-Chek dye penetrant inspection process which reveals cracks or flaws in metal parts too small to be seen with magnifying glass. Dy-Chek causes crack or other opening to "bleed" in scarlet lines against white background.

- **Variation of flame spinning process** is used by Australian firm to eliminate dimensional inaccuracies in manufacture of 18-gage steel bowls for concrete mixers. Flaws prevented smooth rotation on friction rollers when mixer was assembled. In new truing operation, bowls are spun for two minutes at 40 rpm under oxyacetylene flame until bright red band three inches wide appears. With flames still burning, case-hardened rollers are brought to bear on heated zone. External roller is fixed while internal roller is movable, expanding metal from inside.

- **One machine tool builder is working three shifts each on a 56-hour,** five-day-a-week basis. Each shift runs 12 hours a day for four days and eight hours on the fifth day, with two days off. The two days off are rotated among the shifts. Two 12-hour shifts are scheduled for Saturdays and Sundays. The company operated on this schedule during World War II.

Foreign-trained technicians are being grabbed up by some metalworking companies which are scouring local labor sources. One engineering firm, seeking design draftsman with knowledge of heavy machinery, got a German-educated mechanical engineer who had been working as an exterminator on a city job.

- **Some 2000 machines were shown by over 800 exhibitors** (including 18 US) from 12 countries at first European Machine Tool Exhibition in Paris Sept. 1-10. Many very large machines were on display, 50 machines weighing over 20 tons each.

- **A revised military security clause for contractors** has been inserted in Armed Services Procurement Regulation by Munitions Board. Under revised clause, government will notify contractor of degree of security to be furnished. Government will inspect occasionally to insure compliance. Contractors' security costs can be recovered only so far as they are written in his contract as properly acceptable costs.

Recent talk of new weapons has Pentagon security officers jumping. Best guess is that Truman's statement regarding new weapons centered around recent advances in guided missiles. Rumor is that a satellite vehicle is now out of "Buck Rogers" realm and may actually be under development.

- **Progressive reactivation of the 438 plants** in Industrial Reserve now leaves only 48 idle. Defense officials estimate all of these will be active before end of year.

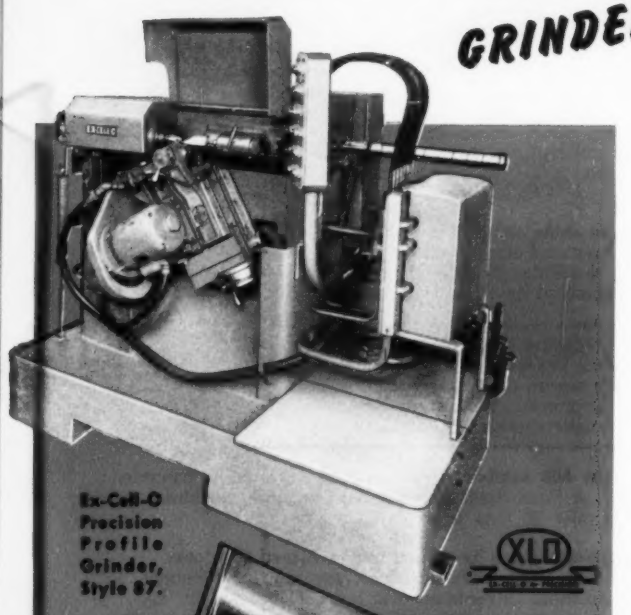
- **Some steel users say that they have been paying through the nose for foreign steel.** When it must be converted to other sizes or shapes after delivery here, it is almost as valuable as gold.

- **A new automobile at dealer's cost is inducement held out to a good engineer** or foreman to join a certain midwestern defense contractor. Report is that management fired one foreman who sold his new car at $600 profit.

- **Prime contractors are being urged by armed services to place orders** for precision-type ball bearings with European sources. Munitions Board survey turned up fact that European companies can make deliveries in 3-4 months.

Ex-Cell-O

PRODUCTION-PROVED GRINDER FOR JET BLADES



Ex-Cell-O Precision Profile Grinder, Style 87.

Jet compressor blades of this type can be ground quickly and accurately on the Ex-Cell-O Precision Profile Grinder.

AUTOMATICALLY GRINDS COMPLETE AIRFOIL . . .

Performance proved in actual shop production the Ex-Cell-O Precision Profile Grinder, Style 87, now is available to shops finishing turbojet engine blades. This machine grinds the complete airfoil form, including leading and trailing edges, in an automatic cycle. Accuracy is assured by use of a master cam made from the engineers' 20-1 layouts.

Operator loads the blade and presses the start button. As the blade rotates and traverses in contact with the grinding wheel the work speed changes automatically—faster on the thin edges and slower on the broad sides of the blades—to produce an accurate contour and uniform finish.

If you would like further information and specifications on the Ex-Cell-O Precision Profile Grinder, please write, wire or phone to Ex-Cell-O in Detroit.

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

EX-CELL-O'S COMPLETE LINE OF STANDARD MACHINES FOR FINISHING JET BLADES: STYLE 85, FOR GRINDING THE ROOT FORM—STYLE 86, FOR MILLING THE AIRFOIL—STYLE 87, FOR GRINDING THE AIRFOIL—STYLE 88, FOR POLISHING THE AIRFOIL

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51-39

Washington

Structural steel and copper are bogging down virtually all mobilization programs except production of weapons. That's the shocker in fourth-quarter allotments under CMP.

• • •

Even steel plant expansion is lagging for lack of structural steel. The controllers now estimate it will slip back at least six months. That means Mobilizer Wilson's goal of 118-million tons of ingot capacity by mid-1953 won't be reached before 1954.

The delay cannot be made up—it may get worse, in fact. The 49% slash in structural steel for steel furnaces and mills in the fourth quarter wouldn't hurt much if that were all. But like cuts will be made over most of next year.

• • •

Aluminum expansion now rates ahead of steel. Ahead of everything except plants making military equipment and atomic energy projects.

Impact of new aluminum plants still is small in terms of structural steel needs. But it will soar next year. And aluminum will continue to get 100% of its requirements, just as it did in the fourth quarter.

• • •

New Air Force goals have put steam behind aluminum expansion. Aircraft production already was behind. Then the military switched emphasis from strategic (heavy bombers) to tactical (light bombers, fighters) aircraft. So that meant more planes, more aluminum.

But aluminum also looms as the prime substitute. The controllers hope it will replace copper for many purposes. They're already urging its use for electrical conductors wherever possible.

• • •

Expansion will go ahead in other critical fields. These include production vitally needed by the military: electronics, machine tools, aircraft. But other new industrial plants will be deferred.

Plants already started will get materials—if they are being built to meet defense needs. But only those producing for the military and atomic program, plus new aluminum plants, are now assured of 100% of materials.

Materials will be handed out to defense plants already started in this order:

1. Those scheduled for completion in 1952.
2. Those owned by "small business."
3. Those more than 40% completed.
4. All others.

• • •

Lack of copper hits all non-military production. Even before the strike, which cut domestic production by 2400 tons a day, there wasn't enough copper to match allotments of steel and aluminum for production using all three metals.

So NPA slapped a super-priority on copper for military and Atomic Energy Commission orders. These orders must be filled by copper suppliers ahead of all other approved controlled material orders. It gives non-military allotments a secondary rating, since there won't be enough copper to fill all orders.

• • •

Consumer goods production already had been cutback to 58% of its pre-Korea copper use. Auto makers got slightly more. But not enough to match the unit output contemplated by the steel and aluminum allotments.

So auto, appliance output will be down, even below anticipated fourth-quarter estimates. So NPA will require standardization, both of completed units and components.

• • •

The copper strike proved this: Truman's plan for using the Wage Stabilization Board instead of Taft-Hartley for settling major strikes won't work unless the union cooperates.

Truman had to resort to a Taft-Hartley injunction, anyhow, when the rest of the big four copper companies refused to accept the Kennecott "package" settlement of 19½ cents an hour.

• • •

Plant hiring dropped sharply during July to a level below July 1950. Contributing heavily to the trend was the automobile industry, the Bureau of Labor Statistics reports. Employment in automobiles has been dropping since spring. The hiring rate dropped in July from 49 to 42 for every 1000 employed.

Increased lay-offs accompanied the July drop in hiring. The lay-off rate jumped from 10 to 17 for every 1000 employed. Most lay-offs were short-term, so that they did not push total unemployment up. Unemployment stayed at a postwar low for the season of the year.

• • •

Now that basic wage policy relating wage rises to cost of living is all set, you can look for special rules on fringes and other internal adjustments.

Wage Stabilization Board hopes to limit fringe benefits to "catch-up" with industry or area practices, but will not charge their cost against cost-of-living allowance.

Most employers will benefit from new policy on correcting inter-plant inequities. It will let low-wage plants converting from non-essential to defense production put their wage rates on competitive level to get needed manpower.

The *Sheffield* Precisionaire is an all-around gage

The Sheffield Precisionaire Gage is equally applicable to all phases of inspection—receiving, tool room, process, quality control and final. Practically any dimension or relationship between elements can be measured.

It is ideal for guiding the individual machine operator in preventing scrap loss. It may be used as a comparator. Also, because of its linear scale, it gives precisely the value of the dimensions being measured so that parts may be classified in size ranges. This assures greater accuracy and faster assembly.

The work may be presented to the gage, or the gaging element at the end of a flexible tube may be presented to the work at any distance from the base instrument without loss of accuracy or gaging speed.

The wide range of amplifications from less than 1,000 to more than 100,000 to 1 provides an adequate choice to meet any set of gaging requirements.

Call your local Sheffield representative or write for Bulletin CTP-491 which gives complete specifications.

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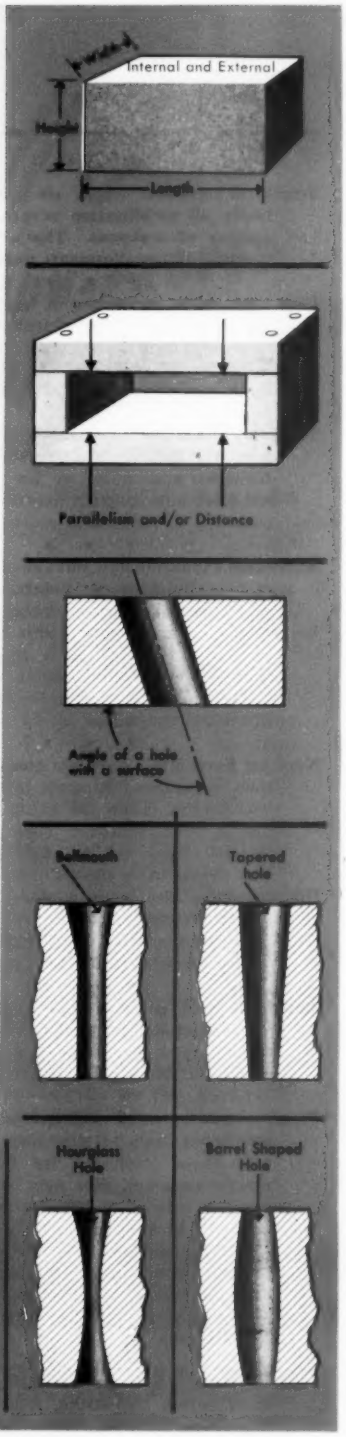


Detroit

How much have your costs gone up during the past year and a half or so? Ford has passenger car figures from Jan. 1, 1950, to July 26, 1951: Wages up $43 million, materials up $98 million.

During that time Ford made approximately 2,317,000 cars. The average increase per car: $42.30 on materials, $18.55 on manpower, $60.85 on both. That's a rough 5% of wholesale. Of course that's an average—today it's definitely more than that.

Nor does it take any account, either, of currently reduced production. As volume goes down cost per car goes up.

You can begin to see why the major producers were clamoring for price increases in Washington.

• • •

Chrysler is clearing its desks for action. You can already see much of the composition of a new younger crew that will move in when the present administrative leadership retires in the next few years. Under comparative youngster Tex Colbert, president, others are coming up fast—W. C. Newberg, age 40, new president of Dodge; E. C. Quinn, 47, new general manager of Chrysler division; John P. Mansfield, 48, vice-president of Plymouth; Ernest C. Dock, 38, new Dodge sales manager; K. C. Deacon, 45, operating manager of Dodge truck; John Brennan, 39, Chrysler jet engine plant general manager; Carl J. Snyder, 55, corporation operating manager. Watch those names.

And here's a strictly hunch forecast: It may not be too long before K. T. Keller, who relinquished Chrysler's presidency to Colbert and moved up to chairman, will retire as chairman.

• • •

Some of the inside story leading up to the General Motors pioneering in torque converter automatic transmissions was recently told.

GM was suspicious of the accepted theories of hydraulic flow. But how prove them wrong? If actual flow could be observed, technicians reasoned, they would have the answer.

A high-speed camera was simple; a speed of 7000 frames a second was decided. An actual transparent torque converter model, however, was more difficult. One was needed which could take the stress of actual oil flows.

Models susceptible to fluorescent and ultra-violet light were tried and discarded. Two years of experimentation followed. Finally a transparent prototype was worked out, high-speed pictures were taken of the process, many principles formerly accepted were found wrong, and GM had torque converters that could do the most efficient possible job.

• • •

Kaiser-Frazer, always intrigued by aluminum, has developed an experimental engine of the light material, in four, six, and V-8 adaptions. Cylinder blocks would be made in two halves in permanent molds, then brazed together. Steel sleeves would be used inside the cylinders. Weight would be about half of orthodox engines.

What K-F is thinking about car design is implied in a current popular magazine article written by the company's engineering chief. Salient points: Lighter-weight cars with aluminum bodies; lots of glass; engines of aluminum, titanium, and magnesium alloys; improved springing; more plastics; better interior design; others.

K-F, incidentally, is moving well on its transition to aircraft-and-automobile combined operations. The first C-119 will be built at Willow Run late this fall; top schedules are expected by next summer.

• • •

Willys Overland is again planning to build a smaller car—the first model is scheduled as a two-door 109-in. wheelbase unit. Several models have been built. Production might have begun later this year, but with the steel outlook what it is, the starting date is indefinite.

• • •

Handsomest power package, if not the most efficient or most compact, is certainly the new "Packette" of Continental Motors. Designed specifically to refuel military aircraft, it has a number of other uses. It's a 6-cylinder opposed-type aircraft motor adapted for industrial operations in the fixed-speed class.

• • •

Production schedules called for declines averaging above 10% in September, bringing the auto industry's total down to around 125,000 assemblies a week, cars and trucks, US and Canada. In August the average was closer to 140,000. October will see continuing reduction.

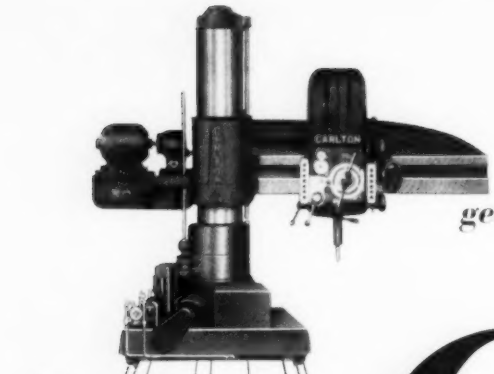
• • •

Footnote: Empire sales of Ford cars fell off, and Ford of Canada had to cut back to a 32-hr week. The Auto Workers Union promptly petitioned management for 40-hr pay during the 32-hr work-weeks.

• • •

Copper products were already tight in automobiles—wiring harnesses, others. The copper mine tieup in the West intensified these problems, made copper the No. 1 short item in automotive planning.

Researchers have continued—without success—to try to find substitutes for copper in radiators, heater cores, ignition parts, others. Aluminum has been widely studied for radiators; the best substitute unit made of it, however, is about twice as bulky.



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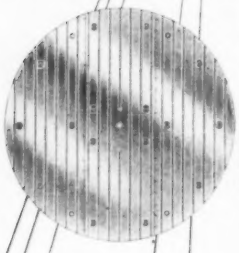
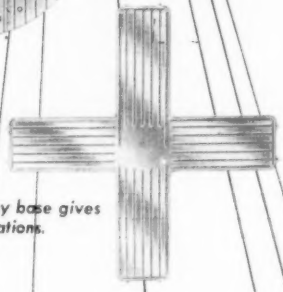
special bases and revolving jigs

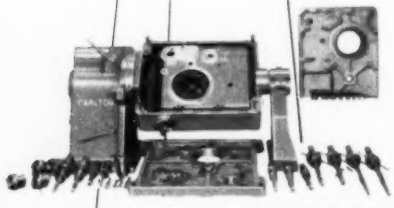
Track-type mounting for long, straight sweeps.



Full round base gives ample space for large work pieces.



4-way base gives four work stations.



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When you buy Carlton, you get the widest possible choice of radial drill capacity . . . for there are 4 different models with an almost unlimited number of column and arm sizes.

And special track-type mounting, seven different types of stationary bases, plain or uni-tilt tables, and revolving jigs . . . are available at slight additional cost . . . to help you increase your hole production.

For complete information, send today for descriptive bulletins.

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A. THE CARLTON MACHINE TOOL CO.

Machine Tools

Volume of pool orders for machine tools is being greatly enlarged. General Services Administration is taking a different view of what it can do with the available funds.

Instead of issuing contracts for a total not exceeding the actual dollars in the kitty, it now says that it only needs to cover with its funds 30% of the orders put out.

• • •

GSA has at hand $180 million in cash which it can use for pool orders. But fact is that it will not process orders for three times the funds available. Total orders out at any one time will be around $350 million.

In explaining this shift in policy, GSA gets a bit technical. Under the former law it gave out pool orders on a "gross liability" basis. It had to cover every dollar of orders with a dollar in government funds.

It operates on a so-called "prudent reserve" basis under the new law. GSA officials regard a 30% coverage of the pool orders as a prudent reserve.

• • •

Pool orders will not run to three times the dollars at hand ($180 million) because a considerable sum must be set aside to buy tools to install in builders' plants to fill pool contracts.

Over $300 million of pool orders are now being processed or have previously been issued. Some $120 million of them have been accepted by builders, GSA states. Of that amount, half represents acceptances since new type of contract was adopted in past few weeks.

• • •

Price order covering used machine tools probably will be out before you read this page. The idea of basing ceiling prices on weights of machines has been discarded.

The order has one unique feature—A definition of what constitutes "reconditioning" and "rebuilding" a machine. Buyers then will have a standard to go on for the first time.

No change has been made in the new GSA pool contracts so far as terms governing 30% advance payment are concerned. Builders still must pay 4% interest on these advances.

Builders also must submit a statement with a supporting facts that private financing is not available. They must tell dates that installments on the cash advance will be needed and the amounts of such installments; and they must give GSA a schedule of production, dollarwise, showing necessity for requested advances.

• • •

Machine tool pricing seems, at last, to be fairly well cleared away. The 12% to be added to the base price, as authorized in the revision to Supplementary Regulation 2 under CPR 30, is the last word. Builders now have the choice of operating under CPR 30 and its amendments or under GOR 15.

• • •

As the price problem fades a bit into the background, shortages of materials and manpower take its place.

NPA's steel people are reported to have promised relief to the machine tool industry, at meeting of NPA Machine Tool Advisory Committee on September 6.

Builders are adding subcontractors in effort to increase production. One company is having machines built in a shipyard and in a carpet factory. A Navy yard is doing work for another builder.

Fisher Body, after all the fuss and fury, is not going to make machine tools. Reasons: its prices are more than double those of the builder for whom it was to be a subcontract. In addition, it would need 350 machine tools to do the job.

Output of machine tools now is at rate of about $650 million a year. Realists in Washington are shooting for a peak of $1.2 billion a year to be attained about middle of 1952. That is double today's rate.

• •

National Machine Tool Builders' Association is sponsoring a series of regional one-day meetings of its members, which began in Cincinnati on September 12. They will be informal and off-the-record and will be aimed at answering questions arising from operations under the defense program.

• • •

Swan E. Bergstrom, vice president, Cincinnati Milling Machine Co., will take over shortly the key task as director of the Metalworking Equipment Division of NPA. He is in England at present and will assume his new duties upon his return.

Swan E. Bergstrom

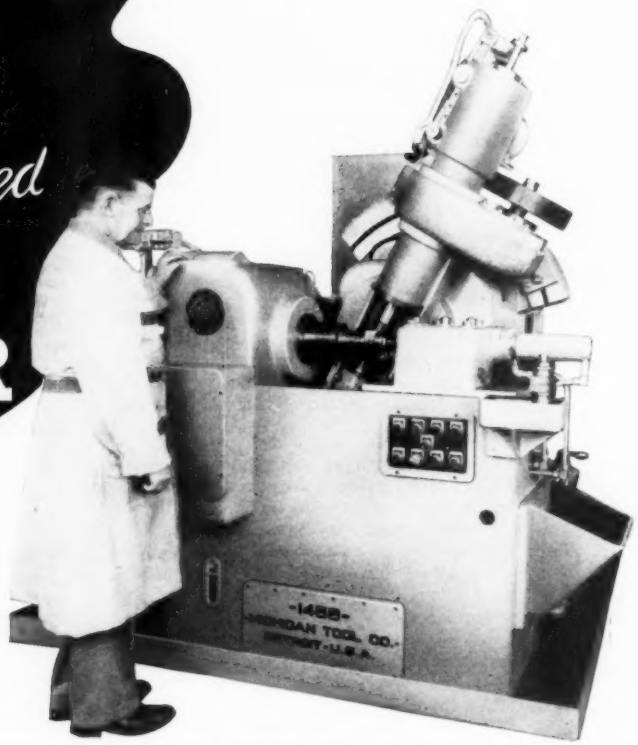
He will succeed Herbert L. Tigges, who will return to Baker Brothers, Inc., Toledo, Ohio, as executive vice president. Mr. Tigges took the assignment on a temporary basis.

Announcing the new

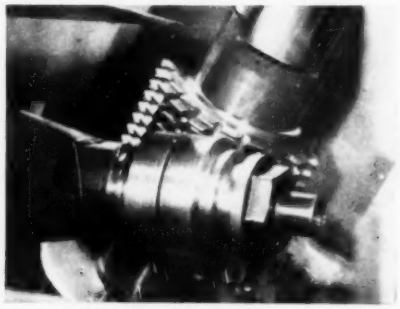
MICHIGAN

High Production High Speed

GEAR HOBBER

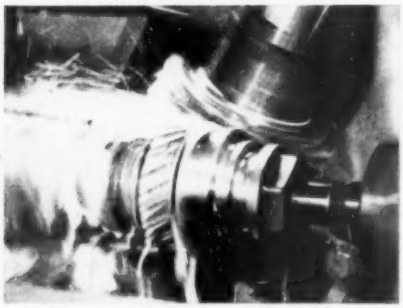


READY TO HOB TWO 3⅛" GEARS



Just before button is pushed to start the cycle.

15 SECONDS LATER



Hob has completed its plunge cut and transverse feed of work starts.

Rounding out its complete line of gear production machines and tools, Michigan Tool is proud to announce successful completion of development and production testing of its spectacular new high-speed, high-production, single-spindle gear hobber—designed to make tomorrow's gear hobber requirements available *today*.

It employs a number of new design and operating principles developed and proven over a period of several years, all of which combine to give the Michigan Gear Hobber output rates which closely approach those of Michigan Underpass gear finishers and "Shear Speed" gear shapers.

For example, the Michigan Gear Hobber can finish-cut two 3⅛" diam. 9 pitch, (2 inch total face width) gears simultaneously to well within pre-shave tolerances, in a matter of 58 seconds, using high speed steel hobs.

For details, write for
Announcement Bulletin No. 1458A.

- **Enables use of HSS hobs at practically 'carbide' speeds.**
- **Hob speeds up to 1000 rpm or more available, if ever needed. (i. e., 1300 SFPM or more with a 5" hob)**
- **Infinitely variable feeds at touch of a dial.**
- **Gear accuracy virtually independent of machine operation.**
- **Positive hydraulic dual feeds eliminate 2/3 of gears otherwise required.**
- **Plunge feed replaces conventional approach feed; gives shorter total hob travel.**
- **Torsional deflection and vibration eliminated, to all practical purposes.**
- **Designed for push-button pre-selective hob shifting and automatic loading (optional equipment).**
- **Quick positive setup, almost foolproof operation; high versatility.**
- **One operator can easily run two or more machines despite high output rate.**
- **Conforms to all JIC standards.**
- **Rigid and compact.**

MICHIGAN TOOL Company

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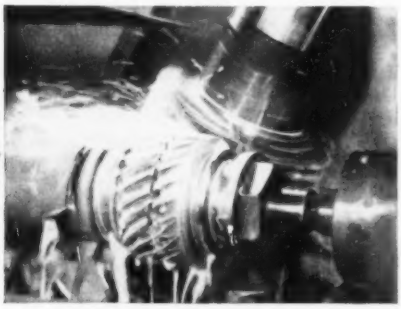
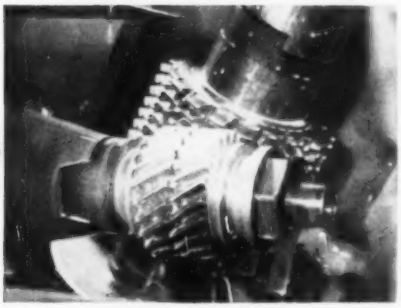
. . . AT 37 SECONDS



Nearing the end of the climb cut.

FINISHED! IN 58 SECONDS



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NOW!

a TRANSPARENT CUTTING OIL that outperforms dark oils on heavy-duty work

• To make the part illustrated, sixteen 10-inch-long internal splines must be cut — a difficult machining job. The manufacturer* formerly used a dark oil, is now using new and improved *Texaco Transultex Cutting Oil* and is getting better tool life. At the same time, the transparency of the oil makes work inspections easier, thus reducing rejects.

*Name on request

It's new and improved TEXACO TRANSULTEX CUTTING OIL

Now, on heavy-duty cutting jobs, operators can see the progress of the work—yet get the same high cutting efficiency as with opaque oils. New and improved *Texaco Transultex Cutting Oil* has proved this in plant after plant.

New *Texaco Transultex Cutting Oil* is truly transparent and truly heavy-duty. Its active sulfur and other extreme pressure additives, plus an effective wetting agent, assure exceptionally fine cutting characteristics that stand up even in prolonged heavy-duty service. Today's *Texaco Transultex Cutting Oil* gives always-uniform performance, has good odor qualities, does not irritate skin.

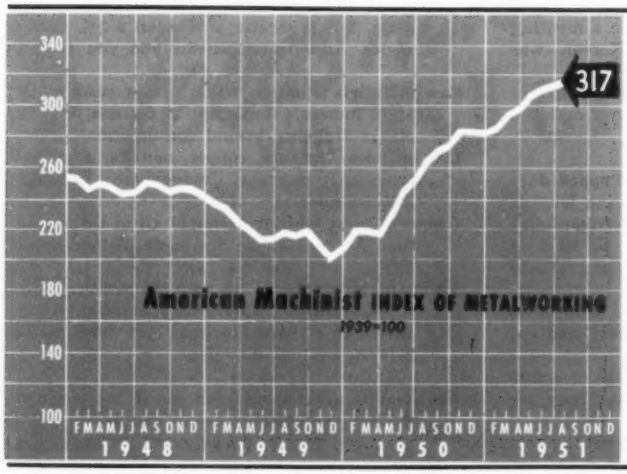
Improve your heavy-duty machining by using improved *Texaco Transultex Cutting Oils*. There is a complete line of them; and a Texaco Lubrication Engineer will gladly give you full information and help you select the right one for your particular work.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG '51	JULY '51(p)	JUNE '51(r)	AUG '50
	317*	314	310	279
Machinery	315	304	251	
Electrical Manufacturing	344	351	321	
Automobiles, Trucks	228	235	264	
Transportation Equipment	438	389	279	
Other Metalworking	322	323	303	

* Estimated (p) Preliminary (r) Revised

Production Will Rise Remainder of Year

The lid is off in metalworking. Production promises to rise slowly but steadily the rest of the year. And keep in mind that manhours being worked today are well over three times the 1939 level.

• • •

American Machinist's Index right now is at 317. By middle of 1952 it may well touch 350. A year ago in August it was 279.

But don't let this upward movement fool you into believing that the index will go as high as in World War II, when it hit 472.

Today's work force is a lot smaller than then. It won't get nearly as big (unless we get into an all-out war).

Sample: our Navy shipyards have at work only a fraction of the number in 1941-1945.

• • •

The truth is that most defense contractors are operating only a single shift on a 40-hour-a-week basis. Some have on a second shift much smaller than the first. Third shifts are rare.

Scarcity of manpower is main reason for this unsatisfactory condition. Chief hitch is reluctance of good skilled men in civilian-goods factories to surrender their seniority rights by transferring to a defense contractor's shop.

Best chance of speeding the defense production program is to subcontract work extensively. This policy will put to work men and machines, if idle, where they are now.

Capital expenditures are slated to keep up for the next year. Biggest deterrent will be the critical shortage of structural steel for new buildings. On the other hand, installation of new production equipment will expand.

Though fresh cuts have been made in allotments of materials for civilian items, the effects will be more than offset by the pick-up in defense output.

• • •

Armament manufacture on a sizable scale is getting going later than planned. Tooling programs are six months to a year behind schedule. And that means that military goods production will hit its peak in 1953 rather than in 1952.

• • •

Steel, more than anything else, is worrying many metalworking companies. Alloy steels are the hardest to get. But plate and structurals are just about as bad.

Steel users are doing some fancy guessing in putting in their requirements for first quarter under CMP. And a surprising number have been negligent in submitting their needs to NPA.

• • •

Severe deficit in magnesium sheet is digging into aircraft operations. Little relief will come until the new Dow Madison plant gets into production.

Structural steel shortage will put real crimp into construction work of all kinds. Acute situation will exist for many months.

Gaging Business

Orders and contracts for military hard goods totaled $4.4 billion in July, compared with a monthly average of $2.6 billion since Korean war started.

This points to further expansion of defense production soon. August is believed to have matched the July figure.

• • •

Manufacturers' sales and new orders dropped during the summer from the late spring level.

Consumer durables (automobiles, refrigerators) dipped sharply. They accounted for most of 9% decline in durables. Fourth quarter should bring a pick-up in business.

Sales of durables in July were up 11% over same month a year ago. But scare buying had not got under full steam in July, 1950.

If you want a rosy view, look at backlogs of orders for manufacturers in all industries. They are up to a giddy $55.4 billion.

Manufacturers' inventories also are up. But the gain didn't cause much of a ripple. Reason: the increase is only half that in earlier months.

• • •

Anti-inflation factor—the daily index of 28 sensitive raw materials shows that more than half the advance in prices from pre-Korea to the peak last February has been wiped out.

But it's no time to crow. Too many pressures are at work to force up prices again. The sixth-round wage increase, for instance, which is reputed to average 7%.

• • •

Best guess on metals prices, as result of new control law, is a climb of 5-10%.

BLS price index today is 185.5, up a bit from 181.5 last January. By year-end, government economists expect it to be 190.

Translated into government's cost-of-living formula, this price rise will mean a 5% hike in wages. Add fringe benefits and you get 7%.

• • •

Raw materials situation makes dreary reading. Out of 38 minerals important to defense, US output is dragging behind consumption in 25.

List includes: iron ore, copper, bauxite, zinc, lead, tungsten, mercury, manganese, chromite, molybdenum and nickel.

Copper is most limiting factor of all in US production. And the strike has made matters worse.

• • •

Jet engine production is at least six months behind schedule, Aircraft Industries Association says. Airframe construction may get even farther behind before end of year.

• • •

The experts are feeling good about the consumer market. As incomes go up and prices fail to go down, people are expected to loosen their purse-strings. Strong market for consumer goods will be prop under business in the coming months.

If a new war scare should occur, be prepared for a spectacular rise in consumer spending. If people should spend as much of their increased incomes as they did in last buying wave, it would be hard to keep inflation under control.

• • •

Volume of new orders for industrial fasteners leveled off during the summer at about the June rate. That was considerably below the rate earlier in the year.

Shipments were up 36%, by weight, in first half of this year, as against same half of 1950. In dollar value, the gain amounted to 58%. Last half will show improvement.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	229.7	230.5	220.1
Steel ingot production (thousands of tons)	1,965	1,995	1,890
Electric power output (million kilowatt hours)	7,146	7,077	6,459
Production of automobiles and trucks	139,553	138,797	188,072
Engineering construction awards (*Engineering News Record*, millions)	$160.5	$257.4	$256.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators, sales (thousands of units)	200	309	507
Vacuum cleaners, sales (thousands of units)	161	195	280
Washers, sales (thousands of units)	140	253	282
Household electric ranges, sales (thousands of units)	63	108	131
Radio production (thousands of units)	540	1,083	666
Television production (thousands of units)	116	327	328
Gear sales index (1935-1939 = 100)	589.1	806.9	410.7
Foundry equipment, new orders index (shipments 1937-1939 = 100)	390.3	393.2	401.8

* Seasonally adjusted.

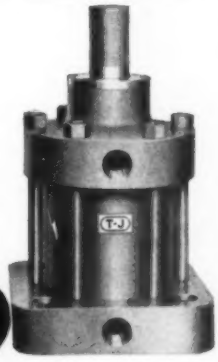
Job File No. 3259

Feeds Automatically with T-J CYLINDERS

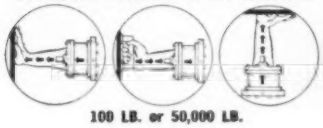
T-J Hydraulic Cylinders furnish efficient, automatic "push power" for feeding devices in this new Ajax-Northrup induction forge heating equipment.

This unit—manufactured by Ajax Electrothermic Corp., Trenton, N. J.—automatically heats steel forging stock in sizes ranging from 1 to 4 inches (rounds or squares) at 2250°F. at rate of 7500 to 8500 lbs. per hour. Has space for 8 heating stations . . . each with *hydraulically operated billet feeding devices employing T-J Cylinders.* These cylinders also eject heated bars automatically. Induction heating with this equipment results in uniformity of successive billets fed to the forge—thus controlling quality of finished forgings and reducing rejects.

Do you have a tough job in power movement—pushing, pulling or lifting? Let T-J help you *simplify machines, save labor* and *cut costs* by using T-J Air or Hydraulic Cylinders! Many standard sizes and styles . . . cushioned or non-cushioned . . . 100 lb. or 50,000 lb. Precision-built, long life. Write for more information. The Tomkins-Johnson Co., Jackson, Mich.



FOR POWER MOVEMENT IN ANY DIRECTION



100 LB. or 50,000 LB.

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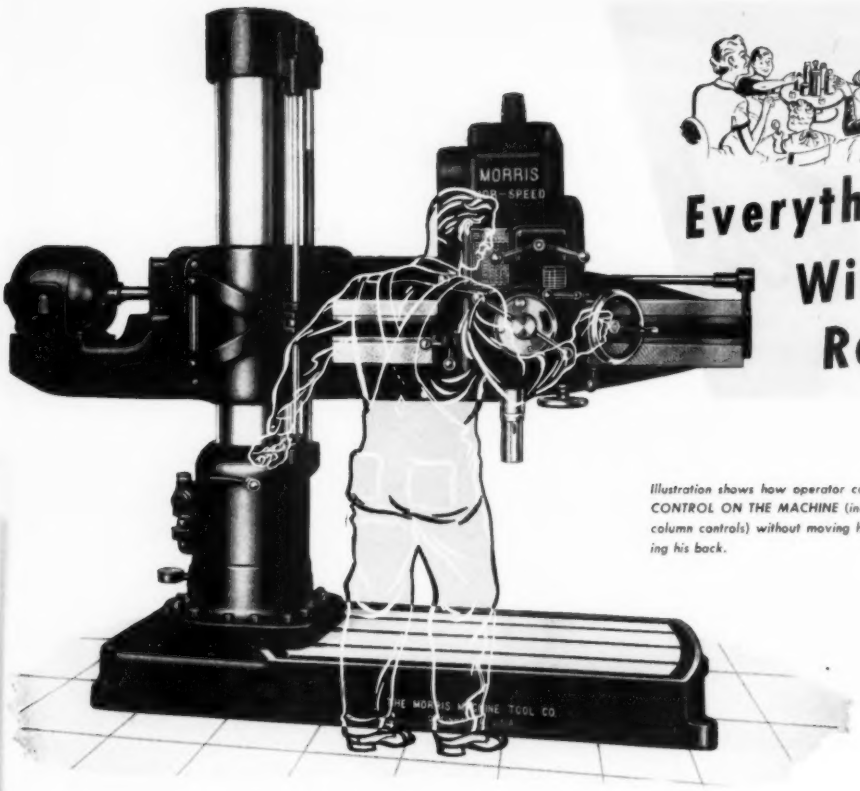
RIVETERS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHERS

T-J



Everything Within Reach!

Illustration shows how operator can reach EVERY CONTROL ON THE MACHINE (including arm and column controls) without moving his feet or bending his back.

Designed to set a cost-killing pace in the race for profitable production, the MORRIS MOR-SPEED Radial Drill offers a long series of outstanding features:

- **Centralized controls—reduces time between cuts.**
- **Variety of Speeds and Feeds—better selection of the right combination for job at hand.**
- **Automatic Lubrication—prevents damage and saves wear.**
- **Greater strength, rigidity and balance—provides greater machining precision.**
- **More automatic stops—saves time and reduces manual control.**

If you are interested in removing metal faster, with greater precision and at less cost, investigate MORRIS "MOR-SPEED" Radial Drills

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Management's Contact Man

Employees of a metalworking company were asked recently how well their foremen kept them informed of what was going on around the plant. The answer jolted the management. 35% said that the foremen didn't try. And 20% replied that the foremen tried, but didn't do very well.

The same group was polled on how much interest their foremen took in them. More than half responded, "little or no interest." The men then were asked, "How good is your foreman in dealing with you?" Four out of six said "poor" or "only fairly good".

SOUNDS SHOCKING doesn't it? An isolated case? Perhaps. But we suspect this unhealthy situation may be more prevalent than management would like to think.

Best proof is the evidence turned up of management's neglect of its own foremen. One large company's top brass checked with all foremen to find out whether their performance had been discussed with them in an organized manner during the preceding year. 37% said "no".

Three case studies, made recently by a consulting firm, revealed deep dissatisfaction of foremen with their treatment by management. In one company, less than 60% of the foremen thought management was doing a good job of giving them information about company policies. They did not understand the time system, wage and job evaluation systems in force. How then, could they be expected to explain the system to their men?

In a second company the foremen complained that they did not know how an incentive system, recently installed, worked. They asked "How can we sell something to our gang if it's Greek to us?"

In a third company, the foremen often learned of management's decisions after their own men had been told by their union leaders. These foremen wanted a chance to know promptly and to participate in management's actions affecting their work. They also thought that their higher-ups should back them up more.

THESE SAMPLES of a "poor relations" attitude toward foremen should be taken as a danger signal to management. Metalworking is in an expanding economy. Thousands of new people are coming into the work forces all over the nation.

The sole relationship with management that an overwhelming majority of these workers will have is through their immediate supervisor. To them, he is management.

He is the natural person to whom they will turn if they want to know something about the company or about their job. If he is to answer their queries intelligently, he must be thoroughly familiar with the company's activities and policies and this goes for old employees as well as new.

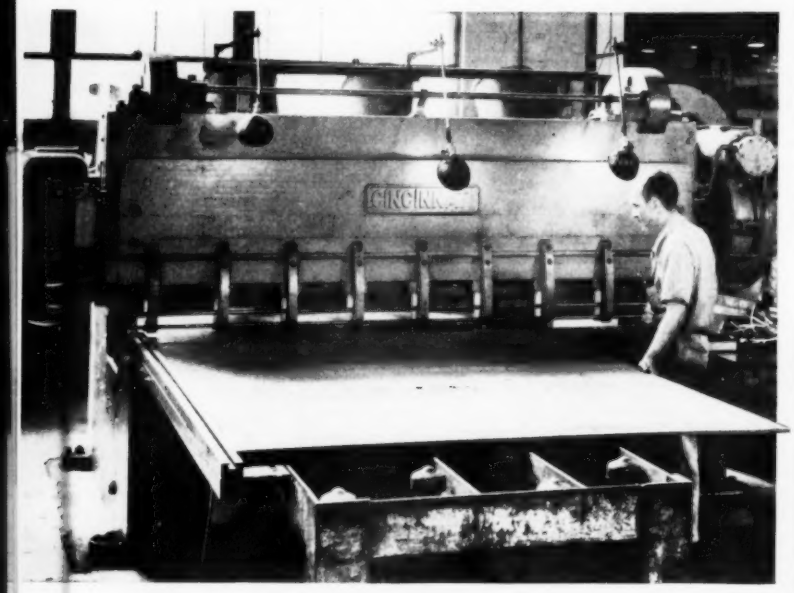
The foreman deserves better treatment than some companies have given him. He should be played up. He should have authority and prestige. He should be flooded with information about the company and its plans; and he should be encouraged to keep his own men informed of the company's policies and programs. His advice should be sought. He should be well paid. Above all, he should be made to feel that he is an integral part of management.

REMEMBER THIS: Every alert, able, satisfied, well-informed foreman is the best possible insurance that things will go well in your shop.

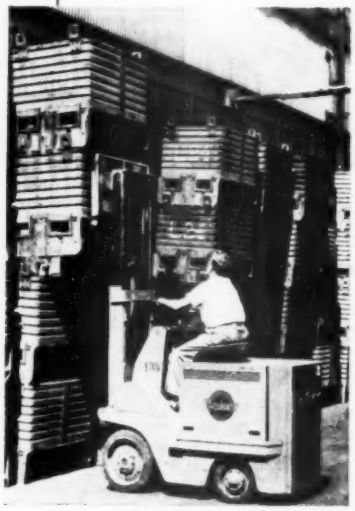
Burnham Finney

• **BAKER-RAULANG COMPANY, says:**

a Cincinnati Shear brought these results



1	lower costs
2	stable deliveries
3	steady stock supply
4	flexible manufacturing



Photos courtesy Baker-Raulang Company, Cleveland, Ohio

With the installation of this Cincinnati Shear, a do-it-yourself program replaced dependence on outside sources at the Baker-Raulang Company, manufacturers of industrial trucks.

Sheets of any required size are now sheared without delay and are always ready for assembly when needed. This results in a smoother, controlled manufacturing schedule, reduced inventory and, at the same time, improved deliveries.

The accurate performance of Cincinnati Shears reduces shearing costs —savings in subsequent fabricating operations result from better fits.

If you use sheared sheets, a Cincinnati Shear in your own shop may save you money.

Write for Catalog S-5—covering the very complete line of Cincinnati All-Steel Shears.

THE CINCINNATI SHAPER CO.

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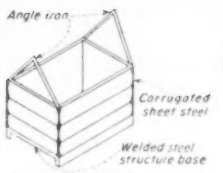
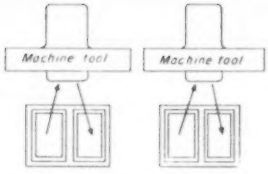
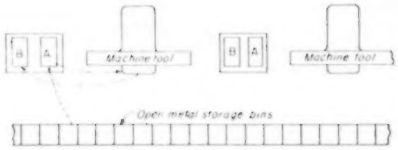




Metal skid bins of various designs are good for storing parts six to seven rows high, and are easily transported to the working area by crane or lift truck



Tote box *A* is filled from storage bins. Parts taken from *A* are processed, then put into tote box *B* for removal to next operation

WATCH 7 OBVIOUS WAYS TO INCREASE YOUR OUTPUT

We are prone to look for spectacular methods improvements, and to forget that day-by-day cultivation of good shop practice really pays the big dividends. By following the course of looking for obvious improvements, over 100 shops have increased production 38 to 64%, and these are plants employing 1000 to 22,000 people! It is our judgment that the average establishment can boost production 50% by employing the seven suggestions advanced

By N. M. PERRIS and H. K. KEEVER, Partners
Stevenson, Jordan & Harrison, Inc.

GOVERNMENT authorities emphatically state that the defense program should accompany civilian production rather than replace it. Economic authorities feel that we should try to accomplish this with a minimum of industrial expansion. We agree with this viewpoint. Some 35 years experience in methods engineering leads us to say that this can be accomplished. One does not have to go far afield to find opportunities for increasing output.

The difficulty with methods engineering is that production engineers look too much for spectacular ideas rather than make day in and day out analyses of better ways of using cutting tools and equipment. New machinery and new conveyors seemingly make a more entertaining story both to the methods engineer and his boss. But methods engineering should be an everyday job. Continuous analysis and followup cannot help but create sound thinking and precise action.

As far as the metal trades are concerned, methods engineering has three broad objectives. They are:

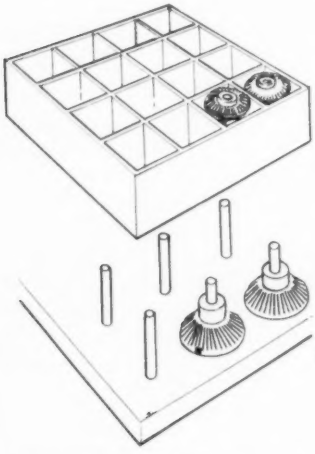
1. Develop the easiest and most practical way to perform a task. This means that you should eliminate, wherever possible, unnecessary lifting, turning, standing and bending, because these factors create fatigue and lessen production.

2. Reduce the skill required in the task. In most metal-working operations, the work elements requiring skill probably take no more than 20% of the total time. If sufficient attention is paid to normal use of fixtures, special tools and gages, tool engineering can devise mechanical ways and means to keep the percentage of skills required down to the figure mentioned.

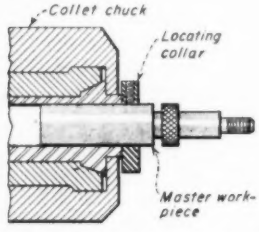
3. Secure uniform commercial quality. State specifically in writing what is *acceptable commercial quality*. Engineering determines the degree of quality. But shop management must determine how to obtain that degree of quality *economically*. To avoid waste time and production, methods engineering should specify in shop terms the easiest way to secure the tolerances required. This is particularly true of surface finish.

OPPORTUNITIES FOR ECONOMIES

These three principles can be successfully applied by paying attention to the seven possible sources of economies in the metal-working shops:



Partioned skids, or skids fitted with pegs, keep finished workpieces from bumping and marring one another



Master workpiece, finished to required tolerances, saves time in setting up automatic screw machines and other equipment

1 DELIVERY OF MATERIALS

WHEN considering material delivery, the following matters should be included:

(a) Convenient skids that can be moved by lift trucks.

(b) Containers of proper size for the type of parts to be handled. Large parts must be free for the use of a hoist. Small parts must not be made difficult to handle, i.e., they must be conveyed in suitable containers and placed within convenient reach.

(c) Location of skids or boxes with respect to the machine is important. Much valuable time is lost when operators are inconvenienced in loading or unloading machines.

(d) Arrangements should be made to have the next job at the machine before the present one is finished.

(e) Parts should always be stacked or racked on skids, because this practice saves time on the next operation, *preserves* finished surfaces, simplifies counting and checking and helps to keep the handling costs down.

2 PREPARATION OF CUTTING TOOLS

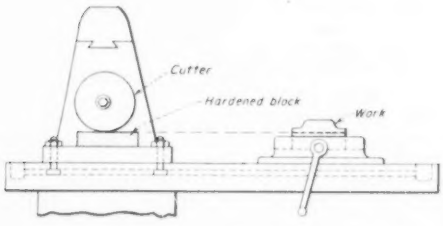
EVERY machine shop should have standardized metal-cutting practices. Tools should be selected by proper type and ground so that they produce uniform results on similar parts and in good relationship on all other work. Although methods engineers do not make all decisions on tooling practices, they should establish standards for the types and uses of all tools. In order to keep this work at a practical level, periodic cutting tests should be made.

3 METAL CUTTING PRACTICES

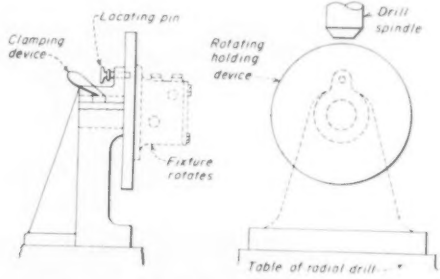
IT IS common to find similar parts being cut at different feeds, the same kind of material being machined at varying speeds, and right- and left-hand parts of the same design being processed with different diameter cutters. Under these conditions it is impossible to establish standard cutting times.

The amount of material provided for machining and the amounts to be left for each separate operation should also be standardized. Turning operations should allow a predetermined amount of stock for grinding. Rough grinding should leave the standard amount of stock for finish grinding. Finish grinding should allow the correct amount of stock for lapping, and so forth.

There is also the problem of two cuts instead of one. Some operations require two cuts—large flat surfaces, better-than-normal finishes, very close tolerances, and so forth. Although this determination is often hard to make, a *guide* or table should be provided to indicate when a part should be cut once and when it should be given two cuts. In practice, it is found that too many parts are cut twice when one cut would be sufficient. It has been found that tool engineering can be of real assistance when the one *vs.* two-cut problem arises. Many times the cutter can be altered slightly by regrinding, or the fixture can be better sup-



Hardened block aids in setting milling cutter in reference to height required on finished work surface



Indexing fixtures on a radial-drill table save time in swinging box jigs into position under the drill spindle

ported, or better clamping facilities can be devised. Examples of improvements:

Cutter Diameter

A 12-in. carbide cutter was run at 330 sfpm at a feed of 7.7 ipm. Depth of cut 3/16 in.; maximum width, 7 in. When cutter diameter was changed to 8 in., the feed was increased to 12 ipm.

Two-Cut Problem

A 14-in. carbide face mill was run at 326 sfpm and 8 ipm. Roughing cut was 0.090 in.; a finishing cut 0.035 in. Maximum width of the cut was 4.5 in.

A 6-in. cutter was used at a feed of 15 ipm, and one cut was sufficient.

Speed, Feed and Fixture

A 4-in. carbide cutter was run at 424 sfpm. Feed applied was 10 ipm and 14 ipm on two cuts. Maximum width of cuts was 2.5 in.; depth of cut, $\frac{1}{8}$ in. Cutter speed was reduced to 325 sfpm, and the feed increased to 15 ipm and 20 ipm. Although a fixture was available the operator did *not* use it because it increased his handling time.

4 MOST EFFECTIVE MANNER OF SETTING UP MACHINES

Setting up of machines is normally a small proportion of the total shop operating time and, therefore, does not receive the close attention that working cycles receive. But the time-saving possibilities offered by improved setting-up facilities make it worthwhile to consider the matter from two viewpoints:

(a) Added mechanical devices.

(b) Convenient availability of tools, straps, clamps, bolts, arbors, etc.

Let us consider added mechanical devices. First, anything done along this line helps to shift skill from the operator to the mechanical means of doing the job. Some of the devices that could be supplied are:

1. Set up to master piece to save excessive number of trial cuts on automatic machine jobs.

2. Multiple-tool blocks holding preset triangular, round, or square solid-carbide toolbits can be adjusted quickly. Thus, feeds can be materially increased without the fear of excessive lost time in changing dull tools.

3. Hardened locating surfaces set to predetermined depths are often used for milling. This feature allows cutters to be set quickly and accurately.

4. Universal jigs can often be utilized advantageously in drilling departments, and reduce tool design cost.

5. Common or special vise jaws can be inserted in the vise that is already clamped to the machine table.

6. Sturdy indexing fixtures, of a universal nature, can be mounted vertically to radial drill tables for the convenience of swinging box-type jigs in different positions. Work is easily set up on this type of mechanism and a very good rhythm can be expected from operators using this type of holding device.

7. Air chucks facilitate both setting up and reducing cycle time.

The convenient availability of tools and supporting items will be found as profitable to consider as providing mechanical devices. Important savings are realized from orderly and convenient storage of properly conditioned tools and operating devices in manufacturing departments. Suggestions are:

1. Bolts, in required lengths and with good threads, should be available.

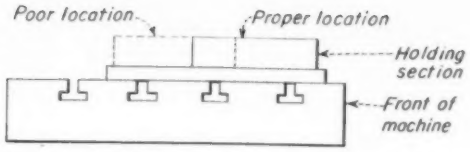
2. Straps and clamps of the types needed should be on hand.

3. All types of arbors should be available as needed.

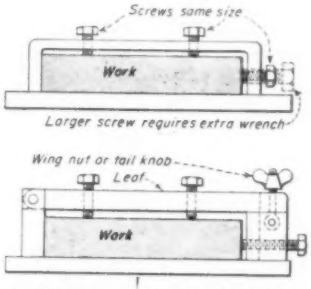
4. Jigs and fixtures should be in good repair and made available as needed.

5. Cutting tools, including gages and special tools, should be on hand at the start of the job.

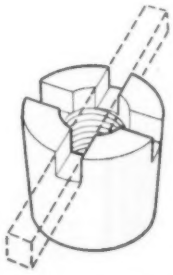
These suggestions are so obvious, one hesitates to make them. Yet, in our daily work in setting standard times for incentives, we find they are carelessly handled both in large and small plants.



Excessive reaching wastes time and energy. Work-holding devices should be placed as close to the front of the machine as possible



Avoid using several sizes of clamping screws in fixtures. When work is large and heavy, use a leaf so fixture can be opened for loading and unloading



Slotted knob allows operator to apply a bar, instead of seeking a wrench and applying same to a square or hex-head screw

5 LOADING THE MACHINE

Tool engineers are of considerable help to methods engineering when they create holding devices that

are easy to load and clean. It is common to find jigs and fixtures that have been admirably designed from the standpoint of making quality pieces, but the manner in which they are designed hinders the workman from obtaining satisfactory production.

Generally speaking, a fixture should be designed to reduce the lifting and reaching requirements of the machine operator when placing and removing a piece. It should be as open as practical in order to allow chips to fall free or be easily removed. Sizes of nuts and bolts, together with the types of clamps should be standardized, because clamping and unclamping is part of the loading operation. Machine operators should not be obliged to have different types and sizes of wrenches available in order to use any one fixture.

Placement of clamps should be made as conveniently as possible to reduce reaching. Fixture and machine interferences should be kept to a minimum. When it becomes necessary to handle large parts (50 lb or over) suitable hoist arrangements must be made. A great deal of time can be lost if hoisting facilities are not adequate.

From our observations we can say that it is not at all uncommon to find inconsistent tool design practices being followed in the same design department.

To solve this problem, tool engineering and methods engineering should coordinate their objectives through a predetermined plan for standardized practices. These practices would be extended to cover the requirements of both engineering groups and would, thereby, permit a uniform control of the activities of the individuals assigned to each group.

6 SELECTION OF WORKING SURFACES

IN ANY operation, jobbing or mass production, it is important to start machining from the correct part locations. This is an obvious necessity, but failure to observe it is a constant source of grievances where incentives are used. Sometimes product blueprints do not indicate important tolerances from correct part locations. In cases where this simple practice is not followed, trouble arises in *fitting parts properly on the assembly floor*. Take an elementary example:

Assume that two completely machined rectangular blocks are to be placed side by side in assembly. However, each block has an accurate hole that is not centrally located, but is at a close dimension from the mating surfaces. It is imperative that the centerline of this hole be dimensioned, showing the desired tolerance from the mating surface of the block. This hole should not be dimensioned from the non-mating side.

If you follow this thought through the many parts that go to make up an assembled unit, you can surely visualize the difficulties that are encountered if dimensioning is incorrectly stated.

An accumulation of errors follows. For instance:

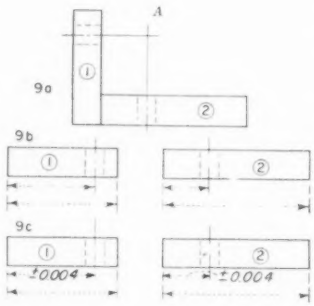
(a) If jigs and fixtures are made to comply with incorrectly dimensioned drawings, the wrong processing resulting therefrom will necessitate the expense of redesigning and correcting jigs and fixtures.

(b) If wrong processing exists, high fitting costs will arise at assembly.

(c) When bad fits are encountered on the assembly floor, inspection is asked for their opinion. Inspection spends time to figure what the tolerance should be, as indicated on the blueprint, to eliminate fitting. The conclusions reached invariably mean reduced manufacturing tolerances. This practice places a responsibility upon inspection that does not rightfully belong there, and results in unnecessary, costly confusion between the shop and inspection departments.

(d) When a a situation of this nature exists, the inspection performed by machine operators is reduced in effectiveness.

(e) What is more important, interchangeability is destroyed, customers have difficulty with replacement parts, sales are lost through unnecessary bad feeling.



Intersection *A* of hole centerlines must be located ± 0.004 in. vertically and horizontally

If pieces are dimensioned without tolerances, we cannot assure correct location

Trouble at assembly is avoided by applying a tolerance to the distance from hole centerline to mating face

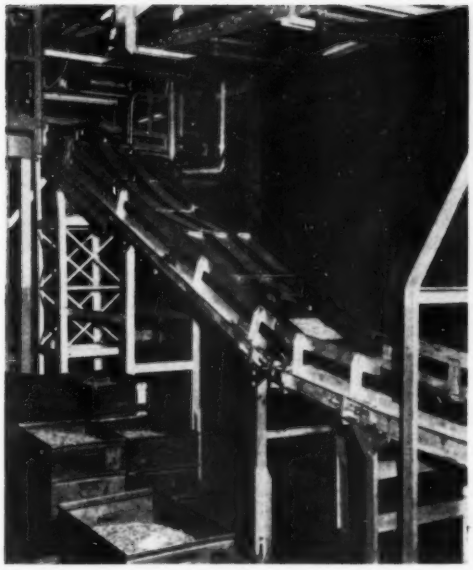
7 PROBLEMS ON THE ASSEMBLY FLOOR

ON THE average assembly floor many corrections are called for that concern all departments, i.e., engineering, tooling, manufacturing, processing and inspection. It is extremely difficult to straighten out methods-engineering problems by appealing to any one functional group. The quickest way to handle problems of this kind is to establish a clinic made up of representatives from top management and the other departments involved.

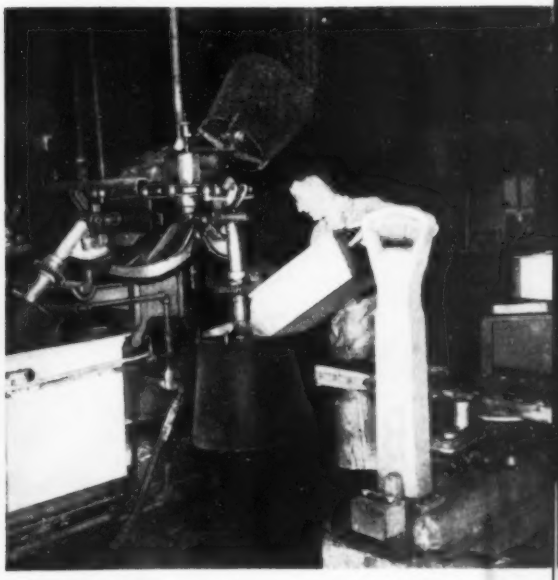
When methods engineering discovers, through time study and analysis, that extra work is being required at assembly, a meeting is called and the factual data are placed before the clinic for decision. If possible, all the separate parts are presented for analysis.

Thus the design, tool engineering, methods engineering, shop, assembly, and inspection departments work hand in hand to eliminate waste in assembly.

There is nothing spectacular about these ideas, but they do increase production. When applied in over 100 shops ranging from 1,000 to 22,000 employees, these obviously good practices increased output from 38 to 64% without increasing worker effort.



Speed-control device on belt conveyor leading down from central control platform consists of weighted steel slats that bear against top of descending tote pans so they will not slip on moving belt. This prevents accidental dumping of loads when pans move too fast down oily belts. Belt lowers pans to roller sections

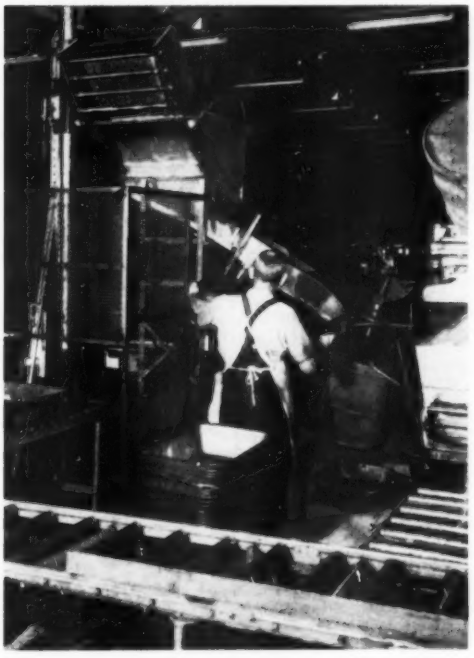


Automatic weighing setup insures exact quantities of parts for plating in Stevens automatic units. Plating is at rate of 6 to 8-amp/sq ft so barrel-loads must be of same size. Syntron vibrator feeds parts from hopper at right into tote pan on scale until limit switch is actuated by scale to stop feeding. Operator then dumps pan into barrel at start of plating sequence

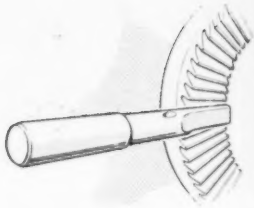
SHOP SHOTS

at

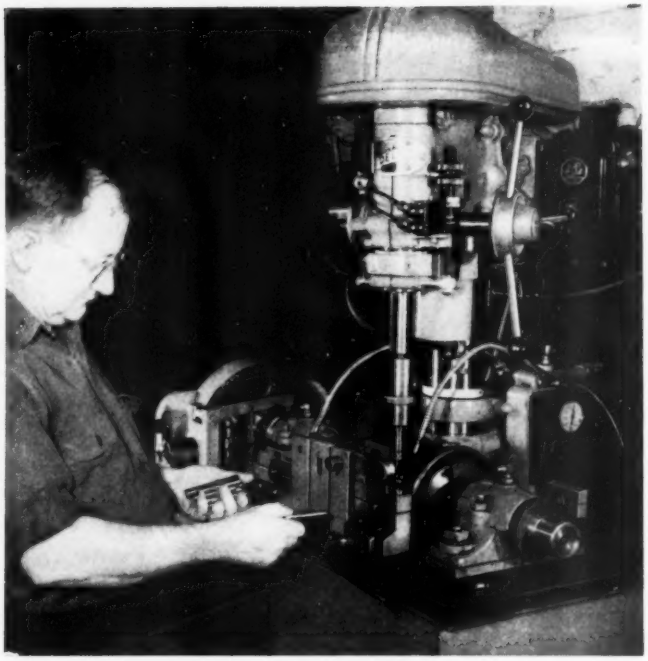
SHAKEPROOF, INC.
DIVISION OF ILLINOIS TOOL WORKS
CHICAGO, ILL.



Automatic dumper elevates tote pan of screw parts from conveyor to hopper at end of Frederic B. Stevens washer for loading into barrel of machine. Hydraulic elevator and Syntron vibrator under hopper are controlled by operator at floor level



ROTARY BROACHES CUT TANGS FASTER



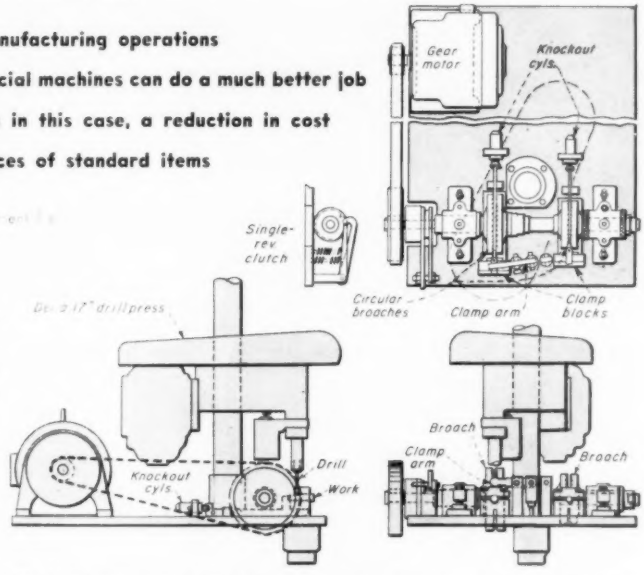
Two-station tang machine has 17-in. Delta drillpress that cuts cross holes through tool shanks; two sets of mirror-image circular broaches that machine the tangs. Other tang is handled by swinging drillhead and clamp arm to left-hand setup

Careful analysis of high-cost manufacturing operations often will turn up spots where special machines can do a much better job than conventional setups . . . As in this case, a reduction in cost can kill the need for raising prices of standard items

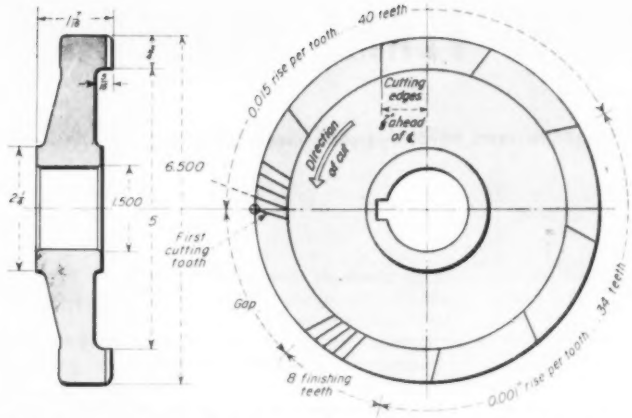
BY JOHN LEHDE, Research and Development Engr.
SCULLY-JONES & CO.

CUTTING tangs on sleeves, sockets, drivers, and cutting tools that have No. 1 and 2 Morse taper shanks is one of the jobs recently improved by Scully-Jones tool and production engineers. The old method of straddle-milling the tangs in a conventional setup was expensive; a wobble-plate fixture like those used for screw-slotting was tried out but was not satisfactory; so the engineers on the job decided to develop a special machine for the job.

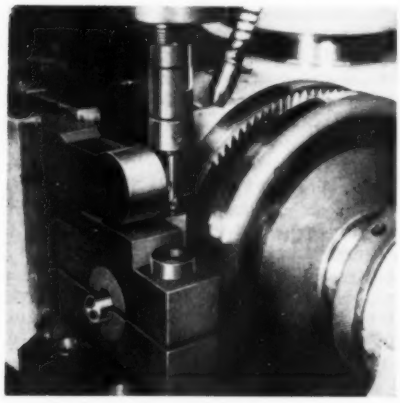
The result of their work is a ma-



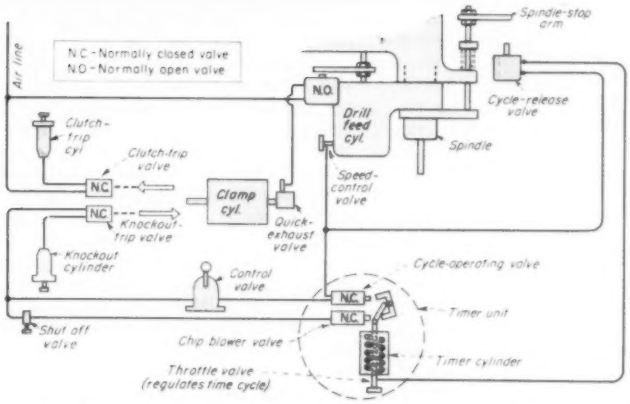
Machine layout is on 36 by 42-in. steel baseplate. Broach spindle runs at 15 rpm, driving cutters at about 30 sfpm. No. 1 Morse shanks are cut by 6 1/2-in. broaches; No. 2 Morse shanks by 8-in. broaches. Head runs at 2750 rpm, driving 5 32- and 7/32-in. drills



Cutters are HSS hardened to 63 R_c, and have 15° negative rake on teeth for shearing action. Of the 82 teeth, 40 rough-cut, 34 semi-finish, and 8 finish the machining. A 40° open gap in the broach circle allows loading and unloading



Clamp arm (with rounded end) forces clamp jaw down on work, against internal spring pressure. Drill then extends down through hardened bushing in jaw. Drill action lags broaches to prevent clamp from releasing while broaches still are cutting



Control circuit includes automatic timer, valves that operate feed, clamp, and ejection cylinders, and speed-control valve on Mead cylinder that feeds drill press, which is primary control motion

chine with two stations (for each taper) that actually takes up a quarter of the floor space required to produce the same volume previously. The job of drilling cross holes through the shanks was combined with the broaching operation, which also saved money. In addition, automatic timing control was added to the rig to produce up to 500 pieces per hour, or triple the production possible on the same machine when only hand cycling is used.

Rotary broaches have two advantages: they permit automatic cycling, and they allow compact machine design.

The clamping fixtures are spring-loaded to stay open while the operator is removing the finished part and inserting a new one. At the same time the open-gap portions of the broaches are passing the work area, so no cutting takes place until the horizontal clamp arm, actuated by an air cylinder, grips the new part in the vise. A fulcrum pin fits in either of the two posts to pivot the clamp arm, depending on which station is being used.

Between the rotary cutters, an ejector blade supports the work until the cycle ends, when an air cylinder jumps the blade to throw the work out into a discharge chute. When the operator has inserted a new part, he opens a master control valve to start up the automatic cycle, which repeats until the valve is closed. When cross-drilling is not to be done on the work, the drill is removed, but the cycle is initiated by pulling the drill spindle down manually.

Most of the parts that are tanged are of 3641 steel. The broaches were made of T3 (18-4-3) super HSS, produced by Illinois Tool Wks. After machining 30,000 pieces, the broaches have shown little sign of wear, and only 0.002 in. of the front face of the teeth had to be ground away for sharpening. Chip disposal is no problem, because the coolant constantly washes them away.

INDUCTION AND FLAME HARDENING

Here's a simple theory that explains some hardening phenomena and shows why desired

BY JOHN OBREBSKI, METALLURGIST, MONARCH MACHINE TOOL CO.

Flame and induction hardening can frequently be employed in place of carburizing, or to obtain some particular heat-treating effects not obtainable by carburizing. No heat-treating process, by itself, can change the nature of steel, and any discussion of flame and induction hardening must be approached from the standpoint of the physical properties of the material to be heat treated.

Of the variables to be considered, the more important include chemical analysis, transformation temperature, hysteresis, grain size and growth, surface conditions, and soundness of the material. And, with cast iron, size and distribution of graphite flakes and the character of the metallic matrix.

Heat-treating literature frequently includes some such statement as: "Because the temperature of the flame is tremendously high and the time of heating extremely short, only a thin case becomes hot and the core remains cold." This conclusion is misleading because the phenomenon of heat treatment is not quite so simple.

To illustrate, assume that a steel cylinder is heated with torches or by induction. The temperature of the whole section increases, but the temperature of the surface increases much faster than that of the core. Distribution of temperatures at any moment can be shown, Fig. 1.

Assuming that t_1 represents the temperature at the beginning of transformation and t_2 is the temperature at the end of transformation, the case having a depth d may be hardened if a proper quenching medium is used. However, only the depth d_1 will be fully hardened; the depth d-d_1 will be partially hardened, and the structure of this area will be miscellaneous (martensite plus ferrite). Although the temperature of the core may be high—for instance, 1300F—it does not necessarily follow that the structure of the steel has been changed and that the core will become hardened when quenched.

This is a relatively simple example but, in many cases, pieces to be hardened have more complex shapes. The heating process itself, therefore, should be studied carefully, and many experiments performed, before adopting any one method as standard production practice.

Positive and Negative Heats

At Monarch, the terms "positive heat" and "negative heat" are used, not so much as scientific connotations as to simplify interpretation by operators of the heating ability of flames and the cooling ability of the material. When explained to flame-hardening machine operators in terms of positive and negative heat, the phenomenon and its significance, metallurgically, became easier to understand.

Suppose, for example, that the surface of a piece of steel, Fig. 2, is heated from one side only with an oxyacetylene flame. A small particle of steel P, at a distance a (equal to zero or some thousandths of an inch) receives a considerable amount of heat from the flame. Because of the thermal conductivity of the material, a part of this positive heat is immediately transferred to area b. When the mass of material b is large, its cooling ability is large, too, and much of the heat delivered to particle P may be absorbed by area b in a comparatively short time. This cooling ability of the material itself is what we call negative heat.

What happens if a flame, or a row of flames, is applied by passing it over the surface of the piece of steel shown in Fig. 3?

With the speed, v, remaining constant, the positive heat—the Btu delivered in a given time—will be the same for all particles from a to f at depth g; while the negative heat—Btu absorbed by the underlying material in the same period—will be different. When the piece is quenched, deep-hardening steel will have a hardened case as shown in the cross-hatched area.

Suppose we want to measure the temperature of the material close to the surface. To do this, an insulated thermocouple is placed as shown in Fig. 4, and the changes in temperature measured as the flame passes over the surface. Measurement of the temperature of a thin case of material, being close to the heated surface, seems to be correct, as the thermocouple has been properly placed. However, the temperature measurement is not correct.

Particles of material located above the hole containing the thermocouple, such as particle a, have a much lower negative heat than particles such as b. A round spot on the surface corresponding to the location of the hole will be much hotter than the surface itself; hence, the results of the temperature measurement may be completely misleading.

Measuring the surface temperature with a disappearing filament pyrometer, or with a Rayotube, should deliver better results. However, the presence of a large amount of the gases of combustion, having a comparatively high temperature, may negatively influence the measurement. And sometimes, of course, it is impossible to measure the temperature,

SIMPLIFIED

results are not always obtained

in which event, other ways must be investigated to control the flame-hardening process.

Applying the Theory

The theory of positive and negative heats has been successfully applied at Monarch to the flame hardening of gears on a Gleason machine. The operation involves hardening at the pitch line of the teeth.

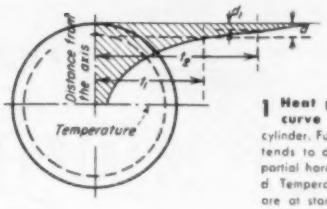
To accomplish this, it might seem that the flame should be directed toward the pitch line. However, as shown in Fig. 5, the area hardened by this method does not extend low enough on the side of the tooth.

Many gears were hardened experimentally to determine the proper angle and position for the flame tips. It was found that best results were obtained when tips were directed toward the bottom of the tooth at a 40° angle, as illustrated in Fig. 6. The phenomenon is easily explained on the basis of a low negative heat at the top of the tooth, and a larger negative heat at the root.

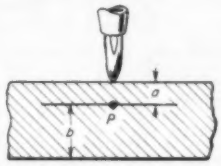
This is not to say that positive and negative heats are the only factors influencing the final result. On the contrary, when a piece of steel, such as shown in Fig. 7, is heated at point *a*, the temperature of the area *b* increases very rapidly and becomes a barrier for the negative heat of the top part, *c*. The negative heat of a given steel may sometimes be compared with the quenching of a flame-heated area. Preheating influences materially the final results because the negative heat of the metal diminishes.

Transformation temperatures of nickel steels are lower than those of carbon or chromium steels. Torches and speed of movement along the tooth should, therefore, be matched with the given steel. When temperature measurement was impossible, we applied an indirect method. Several carbon steel gears were hardened on the machine and samples examined in detail. The changes in structure were found so characteristic that it was possible to determine with a high degree of exactness the temperatures of different areas during flame-hardening.

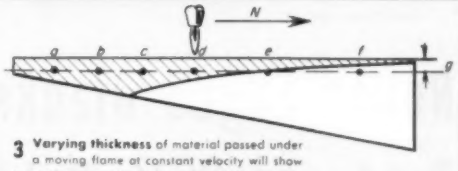
Cast iron, too, was examined from the standpoint of flame hardening. The speed and distance of the torch from the surface of the samples were changed gradually. Effects of different temperatures, up to and including the melting point of the metal, were studied, and led to the conclusion that the greater the distance of the torch from the surface of the metal and the slower its speed, the deeper was the hardened case.



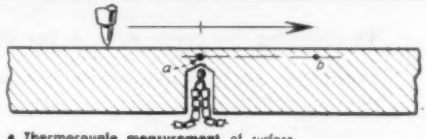
1 Heat penetration curve for a simple cylinder. Full hardness extends to depth *d*, only, partial hardness to depth *d*. Temperature t_1 and t_2 are at start and end of transformation



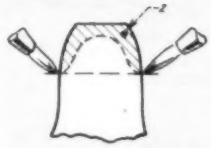
2 Theory of positive and negative heat. Particle *P* receives positive heat from flame at distance *a*. Mass of material *b* absorbs heat from *P*. This is called negative heat



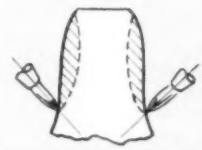
3 Varying thickness of material passed under a moving flame at constant velocity will show a varying case depth because of the greater amount of negative heat in the thicker end



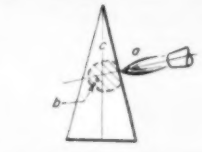
4 Thermocouple measurement of surface heat will not be accurate, as particle *a* will be much hotter than particle *b* because of the greater amount of negative heat at *b*



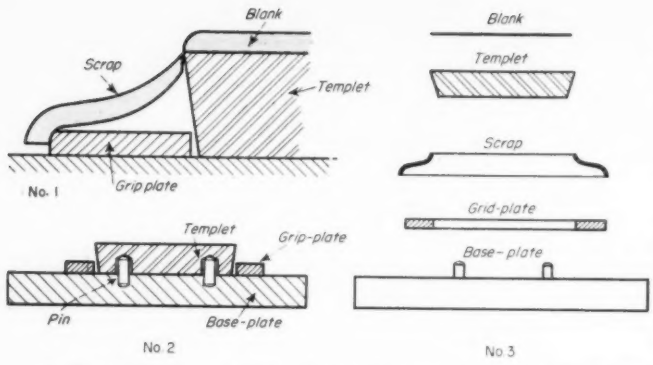
5 Gear-tooth hardening will not be effective if flames are directed at the pitch line, as the negative heat of the gear body will prevent proper hardening below this point



6 Correct position for flames is at tooth root, preferably at a 40° angle. This produces a more desirable hardness pattern along the entire tooth flank, with a maximum case near the pitch line



7 Additional factor to be considered is that when heat is applied at point *a*, temperature of area *b* rises rapidly and forms a barrier for negative heat of area *c*



Production cycle: (1) rubber pad presses downward on stock, bending it over the cutting edge and causing rupture; (2) scrap adheres tightly to die templet; (3) tool is dismantled to remove scrap, and elements are re-assembled

Round-Edged Blanks Produced With Rubber Dies

By obtaining the round edge in the die, ornamental parts do not require a second operation

BY HAIM MURRO
Mechanical Engineer, Jerusalem

PECULIARITIES of the rubber-die blanking process can be utilized to avoid a second operation on experimental or short-run parts requiring a rounded edge.

Ordinarily, in making parts by the rubber-die method, the shop strives to secure the usual "straight" blanked edge. With light gages particularly, the appearance of the blanked edge is much like that secured with steel tools. When working the heavier gages with rubber dies, instead of a very small radius on the side of the blank facing the die, a more pronounced radius is produced. A radius equal to the thickness of the material can be obtained.

This finish on the blank edge arises from the types of stresses induced during blanking. The material is gripped in two places: on the grip plate and on the templet. Between these two points there is an unsupported section which is subject to the pressure applied by the rubber. This pressure causes the material to bend around the cutting edge and also induces tensile stresses in the sheet.

The combination of shear and tensile stresses causes a reduction in thickness of the blank to occur at the weakest point or line—in this case at the cutting edge because of the notch effect. By the time rupture occurs, though, the material has been drawn down over the cutting edge, giving the large radius peculiar to rubber-die blanking of thicker stock.

In the tests made, the tools had these specifications:

Die templet—$\frac{3}{8}$-in. tool steel, hardened and surface ground.

Clearance angle on templet—minus 6°.

Gripping plate—$\frac{1}{8}$-in. mild steel extending to about $\frac{1}{2}$ in. from each side of the templet.

The clearance angle has no particular effect on the radius of the blank.

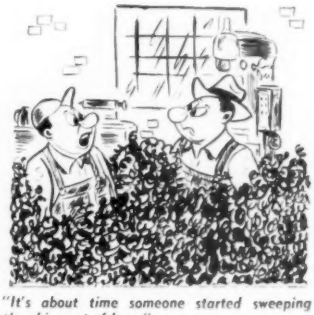
Relationship of the height of the gripping plate to the templet has no influence on the radius produced on the blank edge, but may affect the amount of pressure required.

Material blanked in these tests was mild steel, copper and brass up to 1 mm thickness and aluminum up to 2 mm thickness. Blanks of various contours were produced, and their areas were roughly 2 sq. in. A 75-ton eccentric press was employed.

Production of blanks by the rubber-die method is especially valuable for short-run and experimental jobs. The tools are quickly and cheaply made. But they have one disadvantage: the scrap grips the die templet very tightly and is difficult to remove. Various methods are employed to remove the scrap, but here is one type of tool construction that solves the problem when only a few blanks are needed.

One baseplate and one rubber pad are made to accommodate templets of a given maximum size. Two pins are driven into the baseplate, to serve as a means for locating the die templet. The templet is then prepared. It has two blind holes which fit loosely over the pins in the baseplate.

In making the grip plate, the opening follows the contour of the die plate, but not necessarily the most intricate details. A loose fit is satisfactory. After blanking has been performed, the scrap is removed by lifting off the blank and the various members from the baseplate in the order sketched above. The grip plate and the templet are then re-positioned for the next piece.



"It's about time someone started sweeping the chips out of here."

WORK AND TOOL MATERIALS HAVE DEFINITE PROPERTIES

Further to set the stage for an understanding of how microstructure influences tool life and cutting speeds, the authors discuss:

1.. STRUCTURES PRODUCED BY QUENCHING METHODS

2.. PROPERTIES OF STEELS AND IRONS

3.. EFFECTS OF ALLOYING CONSTITUENTS

4.. PROPERTIES OF FERROUS TOOL MATERIALS

BY MILTON C. SHAW and PRESCOTT A. SMITH
Associate Professors of Mechanical Engineering
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

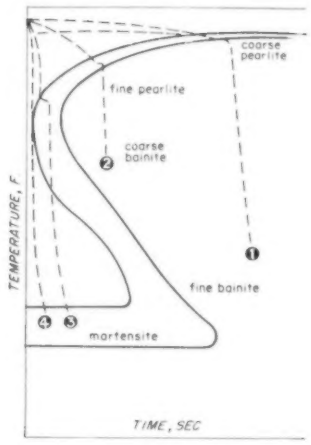


Fig. 1 . . Structures of quenched steels depend upon the cooling rates of the quenching media. Here cooling curves are superimposed on the time-temperature transformation diagram: (1) furnace cooled, (2) air cooled, (3) oil quenched, and (4) water quenched

A PHASE DIAGRAM is useful to predict transformations in structures of steels upon slow cooling, as we saw from the previous installment (*AM*—Aug. 20, 1951, p 89). And we also saw that these slow-speed (equilibrium) transformation products are not allowed to form if isothermal transformation is employed.

The isothermal treatment introduced by Davenport and Bain is known as "austempering". But while this method is important industrially, it is not as commonly used as another method of hardening. In this method, transformation is caused to occur at varying temperatures by using a quenching medium maintained at a low temperature. The resulting structure is not controlled by the temperature of a lead or salt bath, as in austempering, but by varying the heat-transfer properties of the quenching or cooling medium.

Four curves in Fig. 1 show the structures that are produced by furnace cooling, air cooling, and quenching into oil and into water:

1. Furnace cooled—coarse pearlite
2. Air cooled—fine pearlite
3. Oil quench—mixture of fine pearlite, fine bainite and martensite
4. Water quench—all martensite

It will be seen in Fig. 1 that bainite cannot be produced by this method but is only obtained from time-temperature transformation.

Annealing and Normalizing

When steel is heated to about 50 F above A_3, held at this temperature until fully transformed, and then allowed to cool slowly within the furnace, the process is called "annealing". If the specimen is heated to about 100 F above A_3 and is then air cooled, the resulting structure will be a finer pearlite but with coarser grains; and the process is termed "normalizing". These two processes and isothermal transformation are the only ways of forming pearlite.

Pearlite cannot be obtained by tempering martensite for a long time at high temperature. The product of such a treatment is spheroidite, which is merely a special form of tempered martensite in which the carbides are unusually large. Spheroidite can also be obtained by holding for a long time at a temperature just below A_1.

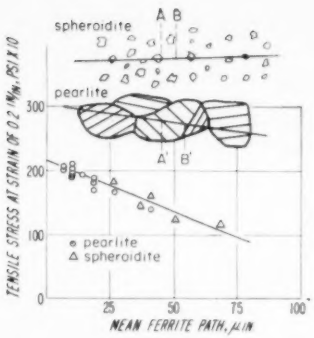


Fig. 2 . . Tensile stress to produce a given amount of strain is a function of the mean spacing of carbide particles, or the mean ferrite path

Properties of Steel Structures

There are only three phases present in any plain carbon steel: austenite, ferrite and cementite. Austenite is relatively soft (350 Brinell) and can take up to 1.7% carbon into solid solution. Since iron tends to strain harden with the number of foreign atoms present, austenite is found to strain harden much more than ferrite. Fortunately, in plain carbon steels austenite is not very stable at room temperature. Ferrite is very soft (B = 80) and does not strain harden nearly as much as austenite, since its carbon content is less than 0.05%. Cementite is very hard and brittle (B = 1000). Nothing is known of its strain-hardening characteristics.

Physical properties of plain carbon steel depend upon three items: (1) carbon content, (2) structure, and (3) impurities.

At room temperature a plain carbon steel (without impurities) consists of a ferrite matrix in which iron-carbide particles are distributed. With regard to hardness and strength, it is not important whether the carbides are in the form of spheres (as in spheroidite) or plates (as in pearlite). Properties of the structure are controlled by the mean ferrite path, which is the mean spacing between adjacent carbide particles along a given straight line. In Fig. 2, the tensile stress to produce a given strain (and hence the hardness) varies linearly with the mean ferrite path, regardless of shape of individual carbide particles.

The mean ferrite path depends upon the carbon content (since the total amount of cementite depends on the carbon content) and the mean size of individual carbide particles. This latter item is controlled by heat treatment. A minimum carbon content of 0.5% is necessary to achieve full hardness in plain carbon steels.

Alloy Steels

Elements other than carbon are frequently alloyed with iron for one or more of the following reasons:

1. To delay rate of austenite transformation to pearlite upon quenching, to allow time for thick sections to harden throughout without use of a quench so drastic as to induce cracks. (Mn, Cr, Mo, W, Ni, Si)

2. To provide additional hard abrasive particles to improve wear resistance. (V, Mo, Cr, W)

3. To provide higher hardness at high temperatures (greater hot hardness). (Mo, Cr, V, W)

4. To provide greater strength at elevated temperatures. (Mn, Ni, Si, Co, Cr, Mo)

5. To inhibit grain growth in austenite during heat treatment. (V, Al)

6. To provide corrosion resistance. (Cr, Ni)

7. To combine with oxygen to prevent blowholes. (Si, Al, Ti)

8. To combine with sulfur or phosphorus which otherwise cause brittleness. (Mn)

9. To improve machining properties. (S, P, Pb)

These alloying elements perform their intended function in one or more of three basic ways:

1. By forming carbides that are insoluble in ferrite. (W, Mo, V, Cr)

2. By going into solution in the ferrite. (Si, Mn, Ni, Co, Cr)

3. By forming inclusions which are insoluble in ferrite. (Si, Al, Ti, Mn, S, P, Pb)

In Table 1 the atomic radii for common alloying elements are given in microinches. Atoms that are smaller than iron go into solution in the ferrite matrix; those larger than iron form carbides. Chromium is so close in size to iron that it is found in both columns. Some carbide-forming elements are soluble in iron, but their tendency to form carbides in the presence of carbon keeps them out of solid solution.

All materials that go into solid solution increase the tendency to strain harden. Manganese and silicon tend to make the matrix more brittle (decrease the strain to rupture) while nickel makes it less brittle.

Materials that form inclusions—silicon, aluminum and titanium—will be in the form of their oxides. Manganese, sulfur, and phosphorous will be in the form of Mn S or Mn P. Lead will be present as small globules.

Manganese, nickel and cobalt lower the A_3 temperature. If present in sufficient quantity, they may make austenite stable at room temperature. Examples are: Hadfield's steel, 18-8 stainless steel, and the high-temperature alloys used in aircraft gas turbines.

Presence of alloying elements in addition to carbon further complicates our picture of steels in the following ways:

1. Additional hard carbides appear. These are more prone than cementite to precipitate in small size. Hence, they tend to provide a smaller mean ferrite path and greater hardness and strength.

2. The harder inclusions such as SiO_2 and Al_2O_3 provide additional hard particles to reduce the mean ferrite path.

3. Elements that go into solution in ferrite cause hardening of the ferrite and an increased tendency to strain harden. Nickel is particularly pronounced in this respect.

4. Manganese and silicon tend to make the ferrite more brittle, which is beneficial in machining,

Table 1 . . ATOMIC RADII OF ALLOYING ELEMENTS, In.

Carbide Forming Elements		Iron	Elements Going Into Solution	
Ti	0.0058	0.0051	Si	0.0047
W	0.0055		Mn	0.0047
Mo	0.0054		Ni	0.0049
V	0.0052		Co	0.0050
Cr	0.0050		Cr	0.0050

while nickel tends to make the matrix less brittle.

5. The weakening effect of inclusions, such as manganese sulfide and lead, is negligible unless excessive in quantity or poorly distributed.

6. Manganese, nickel and cobalt will produce a material with greater tendency to strain harden as the percentage of retained austenite is increased.

Cast Irons

Iron alloys that contain 2 to 4% carbon are referred to as cast irons. Many characteristic structures are found in cast iron. If cast iron is cooled rapidly, white cast iron is obtained. This product consists of cementite particles in a matrix of pearlite. If the same iron is cooled slowly, gray cast iron results. The structure consists primarily of graphite flakes in pearlite.

If the percentage of silicon or carbon is decreased (or if carbide-forming alloys such as Cr, Mo or V are present to tie up carbon) a slower cooling rate is required to prevent the formation of cementite, and to produce the graphite flakes characteristic of gray iron. Nickel in amounts up to 5% promotes the formation of graphite while sulfur has the opposite effect.

Other structures such as free ferrite, steadite and inclusions of sand and slag are sometimes present in cast iron. Free ferrite will weaken cast iron if present in a concentration greater than about 10%, and indicates too slow a cooling rate. Steadite is a hard, low-melting phase (1800 F) of iron, cementite and iron phosphide that forms at the grain boundaries. Its concentration is usually kept below 10% by keeping the phosphorous content of the charge less than 1 per cent.

Malleable cast iron is formed by slowly heating white iron to 1600 F, holding for two or more days and slowly cooling. The resulting structure consists of small nodules of graphite in a matrix of ferrite and the product is very tough.

Cast iron is sometimes inoculated in the ladle to provide a finer dispersion of graphite and a less critical cooling rate. Meehanite is the trade name for cast iron that is inoculated with calcium silicide. Nodular cast irons are produced by inoculation with magnesium alloys to produce a structure of very fine graphite nodules in a ferrite matrix.

Table 2..REPRESENTATIVE MEDIUM-ALLOY TOOL STEELS

C	S	Mn	Cr	Mo	W	Fe
1.2	0.3	0.6	0.5	—	—	Bal.
1.2	0.3	0.7	0.5	0.5	—	"
1.2	0.3	0.3	0.7	0.3	1.5	"
1.3	0.3	0.3	0.7	—	4.0	"

Table 3..REPRESENTATIVE HIGH-SPEED TOOL STEELS

Designation Type	T-1 W	M-1 Mo	M-2 W-Mo
W	18	1.5	6
Cr	4	4	4
V	1	1	2
Mo	—	8.5	5
C	0.7	0.8	0.8
Fe	Bal.	Bal.	Bal.

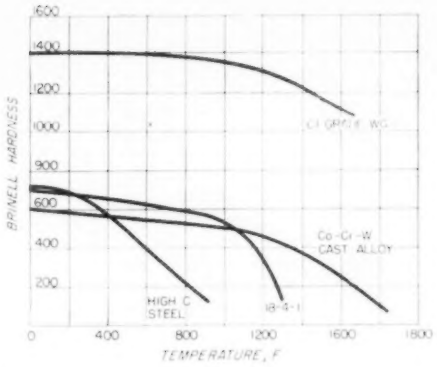


Fig. 3..Hot hardness, a necessary property of a cutting-tool material, depends on type of material and alloying constituents. Note how cobalt improves hot hardness

TOOL MATERIALS

Satisfactory tool materials must possess several characteristics:

1. HOT HARDNESS. At the operating temperature the hardness of the tool must be appreciably greater than that of the metal cut. This item becomes increasingly important as the speed of the cutting operating is raised and the high-temperature strength of the metal cut becomes greater.

2. WEAR RESISTANCE. Welding and strain-hardening characteristics of the tool relative to those of the metal cut must be such that excessive wear does not occur in the operating range of speed.

3. TOUGHNESS. The tool must not be so hard that it is brittle and weak in tension. This is particularly important in connection with interrupted cuts.

4. LOW FRICTION. Coefficient of friction between chip and tool should be as low as possible in the operating range of speed and feed, for least tool wear and best surface finish.

5. FAVORABLE COST. Increased cost of a new tool material and its fabrication must be more than offset by savings from increased production and tool life, decreased labor and overhead.

There is no single tool material that is best in all the above respects. Relative importance of each item will shift with: the nature of the product (high or low precision and cost), volume of production, type of machining operation (intermittent or continuous cut, roughing or finishing, high or low speed, etc.), tool design details, general condition of the machine tool, and physical characteristics of the work material. Tool materials in use today may be classified as follows: (1) carbon steels, (2) medium-alloy steels, (3) high-speed steels, (4) cast alloys, (5) cemented carbides, and (6) minerals—silicon carbide, diamond.

Carbon Tool Steels

The carbon tool steels have low hot hardness and poor hardenabil-

Table 4..REPRESENTATIVE BRINELL HARDNESS VALUES

Managnese sulfide	60
Pure iron	70
Ferrite	80
Spheroidite	150 - 200
Pearlite (eutectoid)	200 - 350
Retained austenite	350
Bainite	350 - 600
Tempered martensite	250 - 800
Hardened tool steel	650 - 700
Quartz	750
Steadite	800
Cementite	1000
Cemented carbides:	
WC + 6% Co	1400
WC + 13% Co	1300
Tungsten carbide	1500
Chromium-iron-carbide	1600
Aluminum oxide	1900
Vanadium-iron-carbide	2100
Titanium carbide	2200
Silicon carbide	2200
Boron carbide	2500
Diamond	7000

ity, and are limited to tools of small section which operate at relatively low speed. The manner in which the Brinell hardness of a hardened carbon-steel tool decreases with increased temperature is shown in Fig. 3.

Medium-Alloy Steels

Small amounts of chromium and molybdenum will improve hardenability. Representative compositions of medium-alloy (oil-hardening) tool steels are given in Table 2. Up to 4% tungsten is sometimes added to improve wear resistance. These steels are widely used for drills, taps and reamers, but their hot hardness is about the same as that of the carbon steels. Hence, they are not satisfactory for high-speed turning or milling.

High-Speed Steels

Today, high-speed steel is misnamed, because it is now the general-purpose material for machining operations performed at low or moderate speeds. Chief characteristics of these steels are superior hot hardness and wear resistance.

Compositions of three popular high-speed steels are given in Table 3. The first is the widely used 18-4-1 tool steel which is typical of the high-tungsten class of high-speed steels. The second is representative of the high-molybdenum steels, while the third typifies the tungsten-molybdenum class. Tungsten and molybdenum behave in the same general way to develop hot hardness. Only half as much molybdenum as tungsten is required on a weight basis to achieve the same effect. All alloys in Table 3 contain about 0.025% sulfur as an impurity and 0.25% manganese that combines with sulfur to form manganese sulfide and thus prevent embrittlement. High-speed steels are also available with 4, 8 or 12% cobalt added to any of the three types listed. Function of cobalt is to increase the hot hardness still further.

Carbide Formers

Tungsten and molybdenum are carbide formers. They combine with iron carbide to form complex carbides. Cobalt does not form a complex carbide but goes into solid solution in the ferrite matrix.

Chief function of cobalt in the matrix is to raise the recrystallization temperature of a material so that it retains hardness obtained as a result of strain hardening to a higher temperature. Cobalt is also the major constituent of the high-temperature alloys for this reason.

Hardness of freshly heat-treated, high-speed steel is between 650 and 700 Brinell at room temperature, but the Brinell hardness of a cobalt high-speed steel may be increased to about 1000 Brinell by gentle shot peening for an extended period. This illustrates the extensive capacity of steel containing cobalt to strain harden. Pronounced superiority of such steel on roughing cutis is due to its tendency to strain harden at the surface when abraded or scratched.

Functions of vanadium in high-speed steels are to inhibit grain growth at heat-treatment temperatures and to provide very hard carbide particles to increase wear resistance. In Table 4, approximate values of Brinell hardness are given for a number of tool materials and steel constituents. It is evident that the complex vanadium-iron-carbide is the hardest constituent of high-speed steel. It is, therefore, advisable to use a tool with increased vanadium content when machining a material that is highly abrasive such as a high-carbon, high-chromium die steel. High-vanadium steels are difficult to grind because they exhibit strong abrasion resistance.

Cobalt and molybdenum tend to promote decarburization. Steels containing them should be finish ground to a greater depth to remove the decarburized layer.

Exercise care in heat treating high-speed steels containing chromium and cobalt to prevent too much retained austenite in the finished product. Retained austenite has a tendency to transform to martensite when the tool is subjected to shock or cold work as by grinding or in cutting. Large internal stresses are set up which frequently cause cracks to develop in the tool. This may occur during grinding or may cause premature breakdown of the cutting edge in use.

High-speed-steel tools are normally tempered twice. Sometimes a sub-zero treatment is added to eliminate retained austenite. In a representative treatment of this sort, the tool would be pre-heated at about 1600 F and transferred to a furnace at 2350 F and allowed to remain until the cutting edge was at 2350 F for one mniute. The tool would then be quenched into warm oil (150 F) and allowed to cool to about 200 F, and then placed in a cold box maintained at minus 120 F for 2 hr. Following this double quenching operation, the tool would be tempered at 1050 F for 2 hr, cooled to room temperature and then finally tempered again at 1050 F for 2 hr. This relatively complex procedure is followed for the sole purpose of reducing the amount of retained austenite to about 5%.

Surface Treatments

Surfaces of steel tools are sometimes given special treatments to reduce sliding friction, and to increase the abrasion resistance. Among these treatments are: nitriding 0.001 in. deep; carburizing, although the case is usually too brittle; chromium plating 0.0001 in. thick; oxidation; lapping, and peening.

Part III of "Metallurgical Considerations in Machining" *will appear in an early number.*

Old Way: Inspecting crankshafts with snap gages and dial indicators

New Way: Chances of error are eliminated and twice the work is turned out with air gaging

HOW *Chrysler Builds Quality* INTO THE FIREPOWER ENGINE

By RUPERT LE GRAND, ASSOCIATE EDITOR

It is not often that manufacturing engineers in the automotive industry have a chance to tool up a completely new engine.

Although accustomed to building a wide variety of engines for higher-priced cars, marine applications and industrial uses, Chrysler engineers were su: ~d to see what was expected in the "Firepower" 180-hp V-8. For this engine is of a quality that experience.i shop men call "expensive" to build.

To meet the challenge, Chrysler drew upon the latest methods for producing high-quality components in mass-production, and devised or insisted upon development of many new methods. Transfer-type machines, special-purpose machines, and brand-new types of machines have been placed in new production lines. Special attention was given to providing fixtures that hold and locate the work accurately, yet can be loaded easily.

All parts are made under quality control. While getting the feel of making the V-8, the shop purposely kept acceptable limits well within those specified by the designers. To aid in keeping work within tolerance, adjustable tooling has been widely employed in order to afford setup men easy means for correcting for tool wear or machine errors.

Emphasis is placed on quick, accurate gaging. Fixed gages are little used. Dependence is placed on air-gaging equipment that shows part quality at a glance, or automatically classifies pieces. And for perhaps the first time in the automotive industry, some parts are inspected under constant-temperature conditions.

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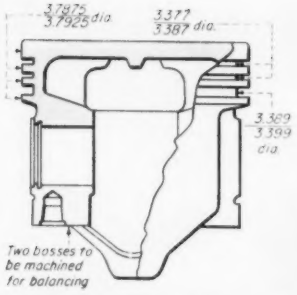
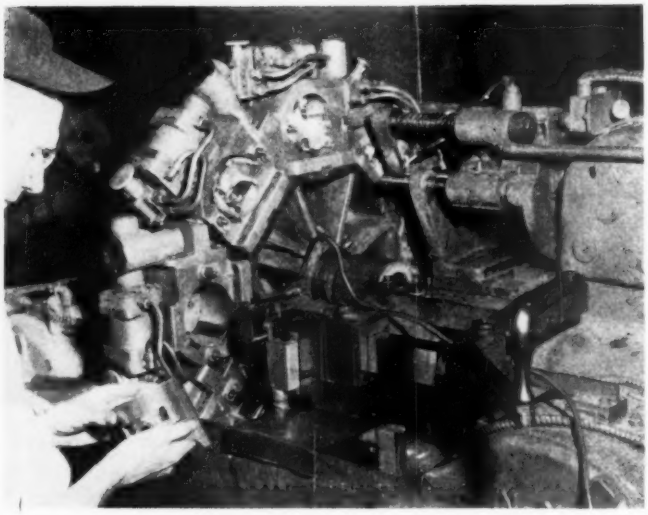


Aluminum pistons for the Firepower engine are distinguished by three ring grooves, two very narrow, and close tolerances, as follows: for squareness of piston-pin hole and skirt with ring grooves—0.0005 in. per in.; for weight, 591 ± 2 grams



Tit on head of rough-turned piston is center drilled, weight bosses are milled and two driving lug holes drilled on 10-station machine

Cam-Turned Piston Inspected in Constant-Temperature Room

PULLING of pistons with feeler gages may be soon outmoded practice in the building of high-class automotive power plants. Chrysler Div. manufacturing engineers believe that selective assembly of an *A*-size piston to an *A*-size cylinder bore will give *precisely* the clearance desired—if both components have previously been measured under controlled-temperature conditions.

The Chrysler Jefferson plant has installed a 70 F constant-temperature room for final inspection of pistons. Cylinder blocks are inspected immediately after discharge from a 95 F washer. In both instances, workpieces are inspected with air gages that are frequently set to masters maintained at the respective inspection temperatures. Thus, errors in clearances introduced by measuring parts at varying shop temperatures are avoided.

To produce pistons—and all other critical engine components—to the close limits established by designers, it is essential to maintain quality control at every critical stage of machining. Because the Firepower V-8 engine is entirely new, the shop takes no chances. At each machining station, a quality-control chart is set up. Limits for acceptable work are held well within the drawing limits. Whenever dimensions begin to drift beyond the shop standards for quality, the setup man is called to make machine or tool adjustments.

Because of close tolerances required on Firepower pistons, a number of innovations in piston-machining practice have been required by Chrysler engineers. Critical tolerances are:

Squareness:

1. Piston-pin hole to be square with the skirt OD within 0.0015 in. in 4 in.

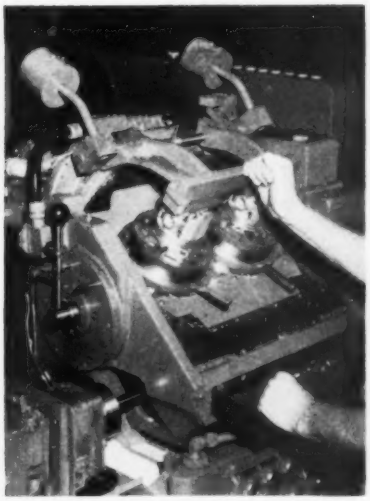
2. Piston-pin hole and skirt to be square with the ring grooves within 0.0005 in. per in.

Weight: 591 ± 2 grams.

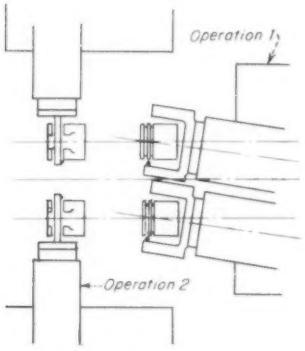
In some piston-machining plants, dependence is placed upon the use of an expanding mandrel engaging the part within the skirt and a dead center engaging a center hole drilled in a tit on the piston head. Chrysler does not want to rely upon a center when finish boring the piston-pin hole and elliptically turning the skirt to be square with the ring grooves. Hence this procedure is used:

At the first operation, a tit on the piston head is center-drilled, weight bosses are milled approximately, and driving lug holes are drilled in the weight bosses. This operation is performed on a 10-station, drum-type machine built by Hartford Special Machinery Co. The piston is squared up by this step, since the part is loaded onto a bar that engages the skirt ID, and an air-operated chuck holds the squared-up piston while the above operations are performed.

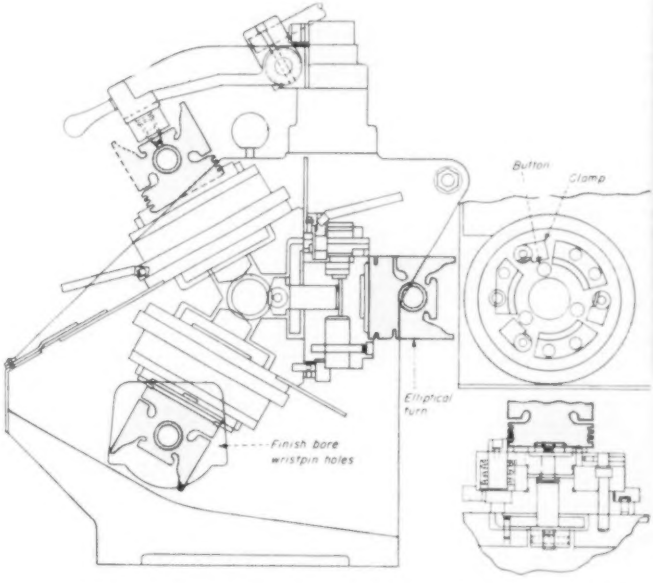
Next, with a center and an expanding mandrel, the part is



Diamond-turned piston skirt has a better finish than normally produced by cam grinding. And the problem of removing grinding sludge from coolant is avoided. Heald drum-type machine has two chucks at each station. Operator places a piston head downward on three locating buttons (left). Counterweighted positioner (right) has two pins to enter predrilled holes in weight bosses, to align wrist pin hole. Finally, a clamp causes fingers to grip, centralize and pull down piston onto the locating buttons. Coolant is temperature controlled



Cam, or elliptical, turning requires that the box-tool axis be offset to work axis by about 5°. Skirt must be turned straight (limit on taper in machining equals 0.0005 in.)



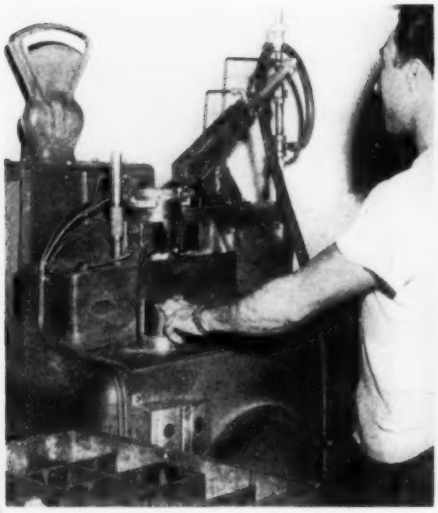
Squareness of skirt diameter and of piston-pin holes to ring grooves is assured by placing piston head on locating buttons in fixture

squared up in a Fay automatic for turning the ring grooves, the OD of the piston at the head end, and facing the head. Note that the head of the piston is now square with the ring grooves.

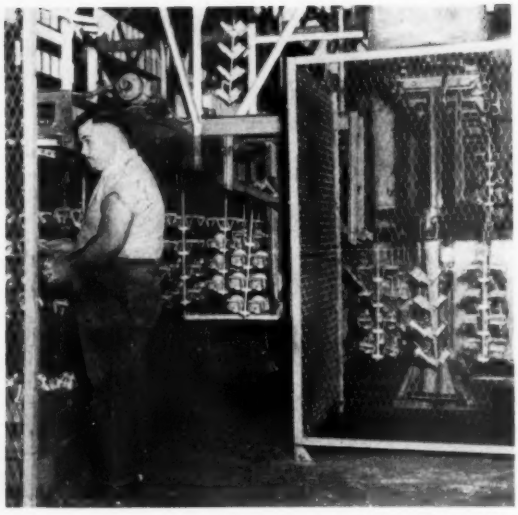
Chips are blown out of the ring grooves by a 4-jet machine to prevent any carryover of minute particles to the tin plating operation. Such chips then become covered up and are very difficult to detect, and they do affect operation of the piston rings.

Piston-pin holes are rough bored on a two-spindle New Britain precision boring machine, and the outer ends of the holes are chamfered.

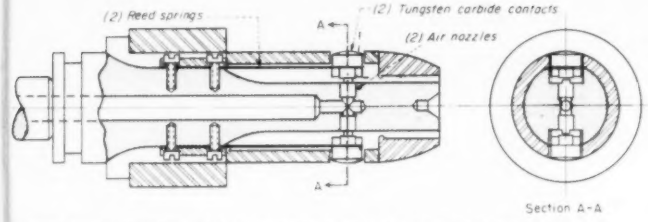
Now the piston is ready for the critical operation of finishing the



Piston is milled to 591 ± 2 grams by Morris mill that weighs piece and automatically sets depth of milling. For a final check, operator reweighs piston on scale before item is tinplated



Conveyor racks of tinplated pistons proceed through a cooling tunnel before entering constant-temperature inspection room. Air discharge from room to tunnel reduces piston temperature to 70 F, which is the desired temperature for gaging



Rough-bored wristpin hole is checked with Taft-Peirce air plug gage, in which the measurement is a function of air flow between nozzles and carbide contact buttons instead of between bore and nozzles. This type of gage is used where work has tool marks or porosity, which would cause an error in indicated size

skirt and the piston-pin hole square with the ring grooves. For this purpose, Chrysler uses a new type of machine tool. Essentially this unit is a combination precision-turning, precision-boring machine fitted with a drum-type fixture, and built by the Heald Machine Co. As each fixture station accommodates two chucks, there are two turning spindles and two boring spindles.

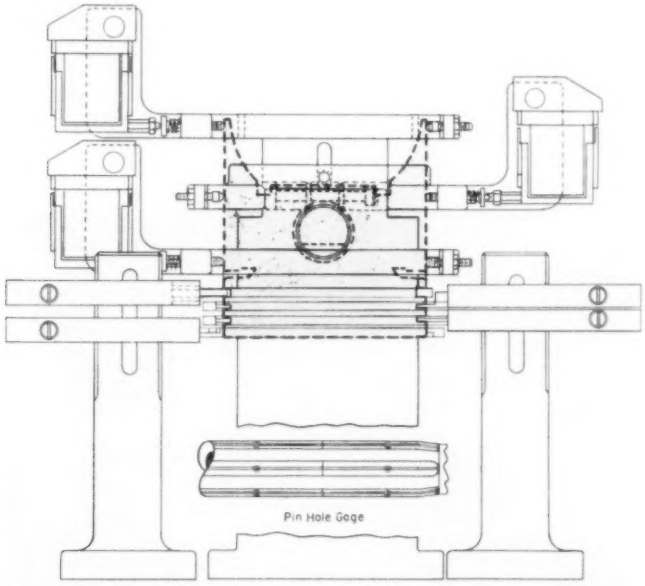
To locate and hold the piston, it is placed head down in a chuck. The head rests upon three locating buttons and is centralized with the chuck axis by three segments. Also, three rotatable clamps enter the top ring groove and pull the piston head down firmly onto the locating buttons. Locking is by spring pressure rather than hydraulics to avoid tool smashup if an oil line fails. The piston-pin hole is oriented by two pins in the overhead clamp, said pins entering drilled holes in the weight bosses. Thus, it will be seen that the piston is located and held square with the ring grooves.

By mounting box turning tools on a slide disposed at an angle of approximately 5° to the chuck axes, the piston skirt is diamond turned to the elliptical or cam shape required to compensate for distortion under engine heat. The camming effect, or difference between the major and minor axes of the ellipse, equals 0.0075 to 0.0085 in. Taper limit is zero to 0.001 in. positive, but is held to + 0.0005 in. over the entire length of the skirt, through use of temperature control of the coolant.

After additional machining operations, the pistons are once more blown off to remove any minute chips from the ring grooves. At this point the pistons are chemically cleaned and tin-plated in an automatic Udylite machine and transferred automatically to the conveyor serving the constant-temperature inspection room. Pistons are cooled down to 70 F before they enter, because air discharges from that room to the cooling tunnel.

Nine critical elements of the piston are checked, at the rate of 2500 pc per shift, on a Pratt & Whitney multiple-station gage. With this "inspection machine," the skirt diameter is graded into one of seven classifications, by 0.0005-in. steps, and the grade is ink-stamped on the piston head. Furthermore, a count of the number of pistons in each grade is kept so that tool adjustments can be made in the machining department, in order to maintain banks at selective assembly with blocks.

All critical dimensions are checked 100% by this Pratt & Whitney nine-station gage. Skirt-diameter classification is shown on large meter, and the average diameter of each piston-pin boss is shown by two points on the meter below. Red and green lights flash to show if width of ring grooves, land and groove diameters are over or undersize. Instrument is reset frequently with master gages. Temperature of pistons is checked at intervals



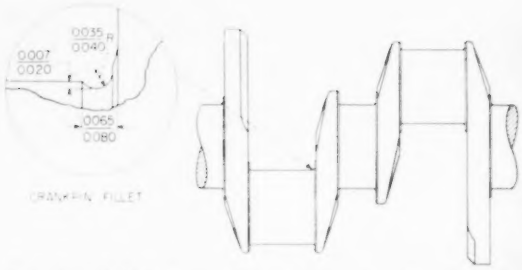
Four sets of gaging elements are required to check the piston. The workpiece is slipped over a plug gage with six nozzles. These average the ID of the piston-pin hole in each boss. Land and groove diameter checks are made with floating electric contact unit. Skirt taper check is obtained by floating electrical gaging units at top and bottom of the skirt. Grading of the skirt diameter is done by a floating electrical contact ¾ in. above the bottom of the skirt. Blade air gages (rear) check groove widths

To check diameter and taper of the skirt, three Electrolimit gages are disposed at each side of the gaging position. These gages contact the skirt at the top, center and bottom.

Gages at top and bottom of skirt feed currents into a differential circuit that shows taper automatically on a single meter. Hence, the operator does not have to read two scales and compute taper. Diameter check is made by the center pair of Electrolimit gages, and a photoelectric recorder energizes solenoid units that mark the grade classification.

Groove widths have a 0.001-in. limit, which must be held. They are checked by blade-type, air-gage plugs made of carbide and provided with integral nozzles. Top groove is only 0.080 in. wide.

Pin-hole diameter—on both bosses—is checked for piston-pin fit with a two-station, air plug gage with carbide strips. Average diameter is checked with six nozzles disposed around the plug OD, because the part cannot be rotated in this setup, and this value is shown on a meter. True ID is checked with two other nozzles.



Forged crankshafts have a fillet at the junction of journals and webs to avoid fatigue cracks. After shotblasting, the journals, fillets and adjacent areas of the webs are ground. A truly round, straight journal is required

Shotblasting is done with cast-steel shot. The crankshaft is placed on fixture cradles that pass through an American Wheelabrator machine. As the work passes through the tunnel, the fixtures are rotated under the shot stream

Eleven Checks Made on Crankshaft in One Air-Gaging Setup

IN MANY respects, the crankshaft is the heart of an automobile engine. Dimensional accuracy and precision balancing are essential to a smooth flow of power. Among many specifications for the V-8 crankshaft, these are some of the more critical ones:

1. Run-out at the center main journal, when the crankshaft is supported front and rear, must not exceed 0.002 in. total indicator reading.

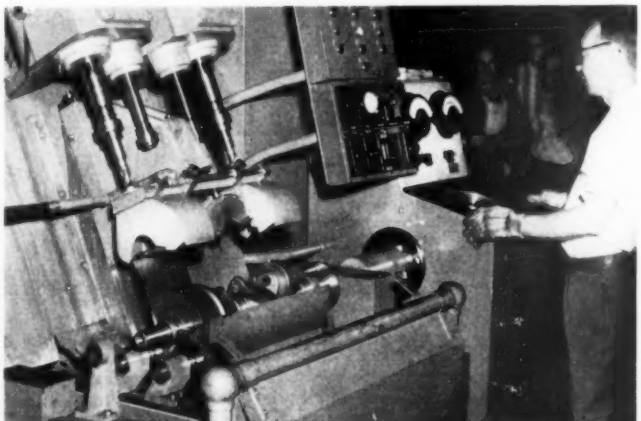
2. Maximum roughness of bearing surfaces is 15 micro-inches.

3. Main bearing and crankpin journals must be within a 0.001-in. limit at the two ends and center, when rotated 360°, in order to assure journals that are not out of round, hourglassed, barreled or tapered. In other words, these journals must be straight cylinders that will run properly with precision-made, semi-aircraft-type bearing inserts.

4. Crankpins must index in relation to the No. 1 pin within $\pm 0^{\circ} - 10'$.

5. The shaft must be designed and treated to avoid fatigue cracking at the junction of crankpins and webs.

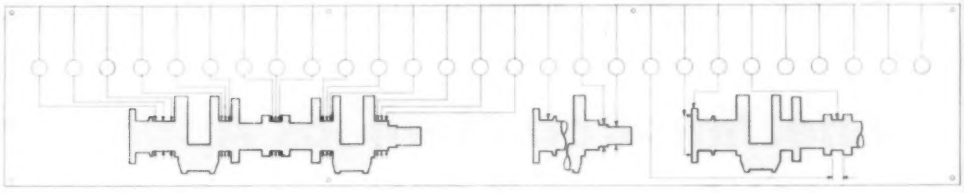
Crankpins and main journals in the V-8 crankshaft "overlap" to impart more stiffness. And fillets are undercut at the ends of the journals to avoid a sharp corner that could be a cause of fatigue cracks. After rough machining, the entire crankshaft is shot peened to raise the physical properties especially at the fillets.



Crankshafts are balanced to 0.2 oz-in. at either end, using a Tinius Olsen machine. After excess metal is removed, the part is re-run through the balancing part of the cycle. Most cranks are now "perfect." Method is three times faster than earlier setup

Checking journals for size, roundness and taper can be done with fixed gages and dial indicators, but method is slow and inattention produces errors

Air gaging gives the operator a complete picture of the dimensional quality of the crankshaft. Man makes the various tests in a matter of a few moments



Schematic diagram on face of the Sheffield crankshaft checker graphically illustrates the great number of checks that can be made in one setup. Operator rotates crankshaft in machine shown for information on main journals, flanges, etc., then applies air-type snap gage to crankpins (headpiece illustration)

Finished crankshafts are inspected 100%. Eleven different dimensional checks are made on a Sheffield air-gaging machine. For a specific element to be acceptable, floating indicators in air tubes must come to rest between preset tolerance markers. Two pieces of equipment are actually used, because so many details must be inspected.

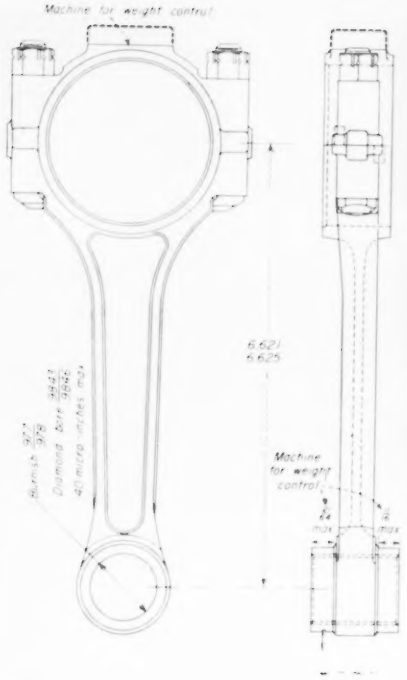
For the first part of the checking sequence, the operator removes the crankshaft from the conveyor and places it upon fiber-faced cradles, which are in the up position. By means of a lever, the heavy crank is then lowered onto rollers. The crank is spun by hand, and the operator notes whether the floating indicators go outside the tolerance markers for main bearings. This check establishes whether the mains are straight, tapered, hourglassed or barreled, because air jets are disposed opposite the ends and center of each journal.

In the same setting of the crankshaft, the operator can visually check by float positions whether:

1. Sprocket and vibration-dampener fits are within the prescribed 0.001-in. limit.
2. Flange diameter and lateral runout are within 0.001 in. and the radial runout is within 0.002 in.
3. Runout of the thrust bearing.
4. Existence of high fillets on main bearings.
5. Radial location of the Woodruff keyway to No. 1 main.
6. Lateral location of the four pin bearings.

To check the crankpins, the operator raises the crankshaft by means of the cradles and applies a hand-snap air gage to each crankpin in turn. While rotating the crankshaft he observes the position of floats on the small air gage set up on the table. This check shows whether crankpins are straight, tapered, hourglassed, barreled, or out of round, because once more three air jets are used—two check the ends and one the center of the crankpin journal.

One air-gaging installation can be operated at a comfortable working tempo and yet handle crankshafts for more than 450 engines per day. Accuracy of the equipment can be checked at frequent intervals by placing a master in the cradles.



Close weight control is essential for connecting rods employed in high-powered, high-speed automotive engines. Forgings are segregated into six weight classifications, and material is broached from the joint faces. Later in the process, the rod is weighed, both ends, on a specal Toledo scale (above). This step presets a Motch & Merryweather machine, which has a face mill that removes metal from the weight control boss on the big end and hollow mill to remove stock from the small-end boss. Both ends must be within specified weight about center to ± 2 grams

Connecting-Rod Methods Approach Aircraft-Engine Practice

WHILE the Firepower connecting rod is not machined all over, as in aircraft-engine practice, exceptional care is exercised nevertheless over weight control, straightness and accuracy of bores. Specifically, the tolerances are:

1. Weight control for centrifugal and reciprocating unbalance: pin end—215 ± 2 grams; crank end—500 ± 2 grams.

2. Crank side faces—ground smooth and parallel because of the side-by-side arrangement of two rods per crankpin.

3. To assure alignment of pistons to bore and crankshaft, the pin bushing bore and the bearing bore must parallel within 0.00075 in. per in., and twist must be within 0.0015 in. per in.

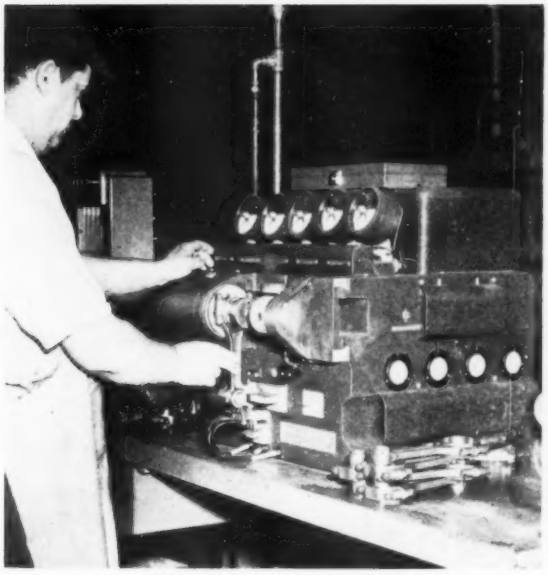
To start production, connecting-rod forgings are separated into six weight classifications. Thereupon, a LaPointe broach is adjusted to remove the approximate amount of material required from the joint faces. Next, a Greenlee with four fixtures and three operating stations drills, semi-finish reams, and finish reams the bolt holes in cap and rod, three pcs of each per fixture.

Final weight control is achieved by a special Motch & Merryweather machine, which is used in conjunction with a Toledo scale. While the machine is operating on one rod, the operator weighs the next one on the scale. Each end of the rod is individually weighed about the center of gravity. Information is fed electrically into equipment that presets the Motch & Merryweather, a two-spindle machine. When the weighed rod is inserted in the fixture and the cycle button is pressed, locating probes and quills advance from both heads until the probes touch the work. Then the quills advance a further amount according to weights to be removed, and are locked. The fixture slide rapid-traverses to the face mill for the big end and the hollow mill for the small end.

Two gaging operations are required to check the connecting rod and to classify it. On the first gage, a Pratt & Whitney Air-O-Limit, five matters are checked:

Operation 1

1. Pin-hole diameter has a 0.0003 in. limit, which is divided into three classifications. The correct value is etched on the small end.



First operation on this Pratt & Whitney gage checks the diameter of the crank hole and the pin hole, and marks the pin-hole diameter classification on the connecting rod. Second operation checks parallelism of big end faces

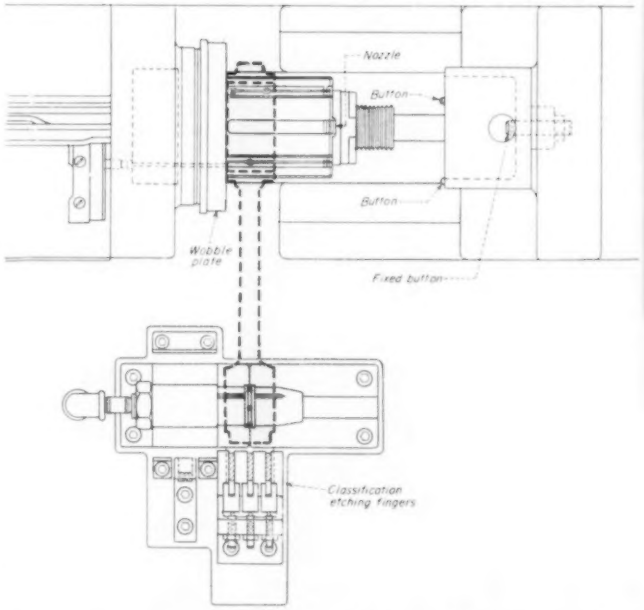
Bending (big-end and small end faces out of parallel) is checked to 0.00075 in. per in., and twist to 0.0015 per in. on this Sheffield "Precisionaires" gage, along with center distance

2. Crank-hole limit is 0.0005 in.

In operation, the rod is positioned on the crankhole plug, and shoved against the wobble plate. By this time the pin hole has centered itself over the pin-hole plug. Six nozzles are employed in the crankhole plug, two diametrically opposite ones indicating diameter. Six nozzles in the pin-hole plug average the diameter reading. With both plugs engaged, the operator reads meters for crank and pin-hole diameters.

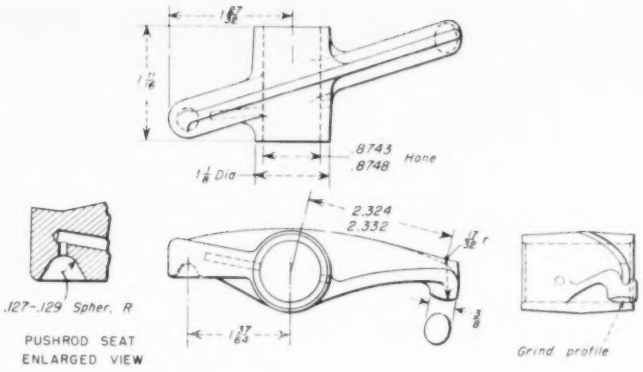
Operation 2

To make the second test, only the big end of the rod is engaged with its plug, and the other end is rotated 180°. A clamping ram is brought into position so that three buttons bear against the big-end face. Width is checked to a limit of 0.002 in. by an air nozzle in the end of the big-end plug and a stop in the ram. Squareness of the crank hole with one face is checked with two staggered nozzles 180° apart. Parallelism of the crank-hole faces is picked up by the wobble plate and electrical gaging devices.



Connecting rod is shown in position on P&W gage for performing inspections listed under "Operation 1" (see text). Wobble plate is used later in conjunction with clamping ram to measure squareness of the crank hole with one face and parallelism of the faces

Angular position of the arms on the rocker arm with respect to the thin cylindrical body makes it difficult to hold the shaft hole, pushrod seat and valve face in the required relationships. Procedure is to bore the shaft hole, drill the seat and mill the pad, then finish bore and hone the shaft hole. Now with a highly accurate hole for location purposes it is possible to finish the seat with a honing tool and grind the compound radius on the valve pad



Long, Angular Rocker Arm Poses Machining Problems

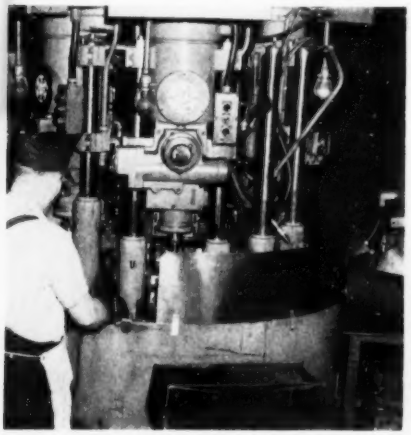
OF ALL parts in the Firepower engine, the rocker arm probably required the most ingenuity in devising suitable manufacturing methods. This small part, weighing only a few ounces, is of critical importance in the functioning of the valve train. Thinness of the cylindrical wall makes the part difficult to hold in certain operations, and the angularity of the arms with respect to the body contributes to the problem.

As the rocker arm is a relatively high-production part, Chrysler has tooled up the line with several new and special-purpose types of equipment. In the first setup, a four-station Hoern & Dilts machine is used to produce the rocker-shaft hole and the pushrod cup in the following sequence of operations:

First station—Core drill the shaft hole with vertical spindle; drill pushrod cup with horizontal spindle.

Second station—Semi-finish bore the shaft hole, mill spherical radius in cup, and face off the valve pad.

Third station—Finish bore and chamfer shaft hole, using Briny boring bars for easy tool adjustments.



Honing of rocker-arm shaft holes provides the accuracy considered necessary for location when finish honing the seat and grinding the valve pad

A chain feeds the fixtures containing rocker arms to the formed wheel of a special Ex-Cell-O grinder. This machine produces the compound curvature required on the valve pad. Coolant: grinding oil

Adjustable Briny boring bars provide for easy tool adjustments when finish boring the shaft hole on a Hoern & Dilts four-station machine

Compound radius on valve pad is milled in a Producto drum-type miller equipped with two fixtures. Cutters move in arc as table moves out. Each station holds four pieces

Fourth station—Load and unload.

To prevent inaccurate work as the result of distortion, the fixtures were changed from locating the piece from the thin cylindrical portion to locating by clamps that bear on the arms.

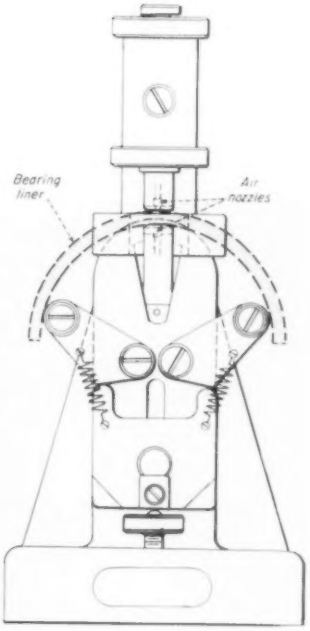
To finish bore the rocker-shaft hole, the piece is located in the fixture of a Simplex precision boring machine, using the valve pad, the cup and one face for locating.

Following drilling of the oil holes, the rocker arm is loaded into a fixture on a multiple-station Micromatic honing machine, which has a sizing ring at each station. The entire superstructure of the machine revolves so that the first operator can rapidly load either exhaust or intake rocker ram arms into the fixture, and provide room for two men at the opposite side to remove finished workpieces and check them. These honed bores must check within a 0.0005-in. limit.

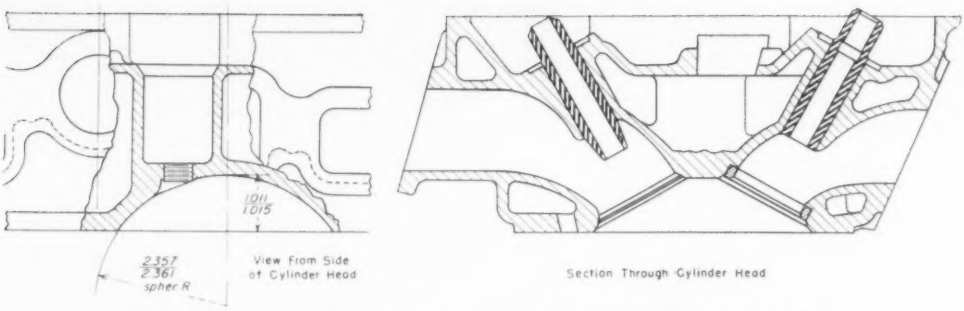
Ball seat for the pushrod is honed on a Hoern & Dilts that employs a small pencil-type, ball-nose honing tool. Now with the bore and ball seat finished, it remains to grind the compound curvature on the valve pad. Looking at the valve pad, as seen in the side view, the cylindrical element lines in the profile must be parallel with the hole axis. And the ends of the faces are dubbed off in a curved path. The compound curvature thus required is obtained by sweeping the work past a formed wheel. The operation is carried out on a special belt-fed Ex-Cell-O grinder, the belt being fitted with a number of fixtures.

Bearing Thickness Checked Without Marring

WALL THICKNESS of connecting-rod and main-bearing liners is checked on an adjustable Taft-Peirce "Comp-Air-Ator" fixture. Gaging takes place between the supporting anvil and the adjustable spindle above. Anvil and spindle each have an air jet recessed below the surface and connected to a common air circuit. The part is inserted between the two air nozzles, and the thickness is shown on an indicator. Measuring takes place without frictional contact on the work, thereby elminating marring the soft bearing surface. This is particularly important, because Chrysler uses aircraft-type bearing liners with only 0.005-in. babbitt thickness in order to increase the endurance life of the engine. Further, to avoid bearing scratches, the assembled engine is fitted with a full-flow oil filter. This traps any particles of abrasive, chips or core sand left in the engine, despite great care in respect to cleanliness in parts manufacture and assembly. Hence, if a tested engine is torn down, one will not find scored or scratched bearings.



Bearing inserts from 1¾ to 3¾ in. ID can be checked for thickness

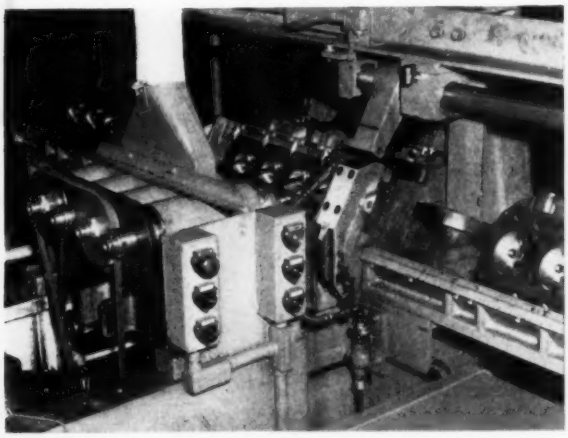


Spherical combustion chamber, first time used in a production engine, required development of a new type of milling machine to generate the required shape, while affording the finish and accuracy required. Section at right shows valve seats cut into the chamber

Spherical Combustion Chamber Called for New Milling Method

WITH management's decision to put the Firepower engine design into production, Chrysler manufacturing engineers were faced with the problem of how to machine the spherical combustion chamber in the cylinder head. The spherical combustion chamber is perhaps the outstanding feature of the engine, and for this reason every care must be taken to assure that it is made correctly in itself and in relation to the laterally arranged valve train.

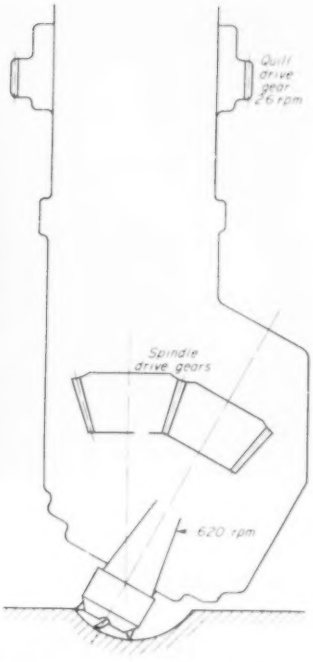
To attain the desired 7.5:1 compression ratio, the combustion chamber must have a volume of between 97.7 and 99.7 cu cm when the valves and spark plug are installed. Therefore, in machining the spherical recess in the cylinder head, the height is kept within an 0.004-in. limit and the radius to an 0.004-in. limit. Finish is important, because one of the properties of a spherical combustion chamber is that of resisting the formation of carbon deposits. These, in an ordinary combustion head, may decrease engine efficiency 10% in 10,000 miles of service. It follows, then, that toolmarks are not desirable on the spherical surface. The machining method must provide a good finish, yet not take excessive time.



Valve seats and valve-guide holes are machined in the same setup, using a New Britain contour precision-boring machine. Reaming of valve-guide holes follows for good alignment with valve seats

Final inspection of cylinder heads involves checking valve seats for out-of-roundness with respect to valve guides and low spots

Two combustion chambers, the first and third, then the second and fourth, are milled at a time on the special Cincinnati two-head machine. Each milling cycle is rapidly performed



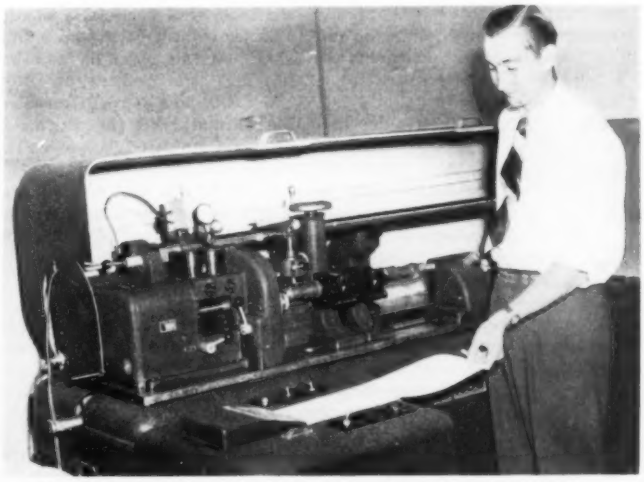
Milling head acts like a top when about to run down. Four carbide bits in cutter head sweep the surface desired and produce good finish

Cylinder-head machining is carried out on a line, in which transfer type and individual machines are integrated. When the cylinder heads reach the special two-spindle Cincinnati spherical milling machine, the operator locks them at a fixture position where the first and third chambers are milled by the two heads. In the next operation, he moves the heads to the second station of the fixture, so that the second and fourth chambers are milled.

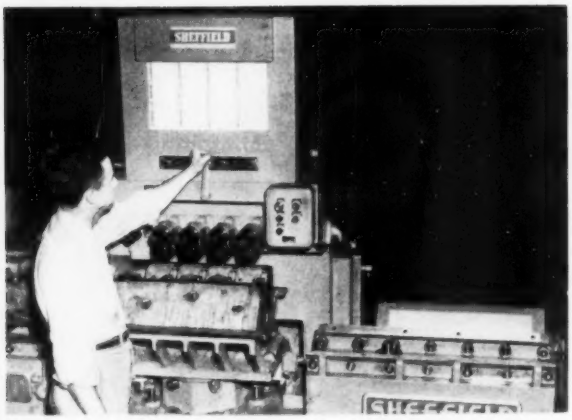
In layman's language, the milling heads cause their spindles to operate much like a toy top that is about to "run down".

To explain the machine action another way: Suppose a plane is passed through a circle. If the segment is rotated about a fixed point, a sphere will be generated. Thus, as the cutter spindle moves in a cone-like path, the cutter head sweeps a spherical path. To start the cycle, the spindle is lowered to depth with the cutters rotating, then the head rotates. Four standard sintered carbide bits are arranged in the cutter body. Maximum feed rate is 31 ipm.

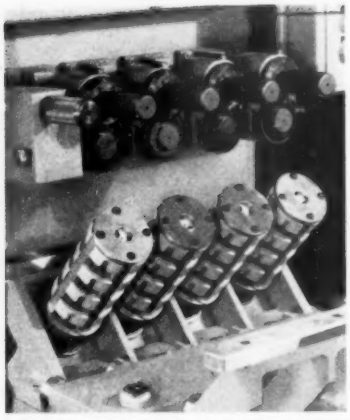
Accurate relationship of the valve seat and the valve-guide hole is obtained by incorporating a New Britain precision-boring machine in the cylinder-head line. In operation, this machine bores half the length of the guide hole, then faces in on the seat, then faces out on the seat, finally bores back out on the guide hole. Reaming of the guide hole follows.



Master camshafts from Norton camshaft grinders are inspected periodically on this Vinco machine, which is kept in the constant-temperature room. Actual workpieces can likewise be inspected at intervals. A follower simulates a valve tappet. Keyway location and all cam lobes are checked with respect to the No. 1 exhaust cam. Operator can watch dials or let chart record be drawn



Four cylinder bores are checked simultaneously on Sheffield machine for diameter, out-of-roundness, taper, and barreled or hourglass shape. Lighted screen, right, helps visual inspection of cylinder-wall defects



Gaging spindles in the up position, as if centered in the cylinder bores. Diameter-classification stamps are above spindles

Cylinder Block Requires Honed Main-Bearing Bores

CHRYSLER engineers are building long life as well as high performance into the Firepower engine. Tests indicate that life between overhauls has probably been extended almost 100%. In achieving this, basic design improvements are a factor, but equally important is the care exercised in holding cylinder bores, crankshaft bores and camshaft bores round, straight, in alignment and to close tolerances. Specifically these limits must be held:

Cylinder bores—standard bores divided into five classifications advancing by 0.0005 in. limit; maximum out-of-roundness, 0.001 in., maximum taper 0.001 after honing; surface finish, 15 to 25 microinches.

Camshaft bearing bores—0.0005-in. limit, limit on misalignment, 0.001 in.

Crankshaft bores—0.0005-in. limit after honing; 0.001-in. limit for misalignment at any one bore.

To make certain that these requirements are met on the production line, the following steps are taken:

Nuts on main-bearing studs are set with a Kirkman machine so uniform tension is induced. Rough boring of the crankshaft and camshaft bores is done on a Snyder, and semi-finish boring on a Simplex. At this point the camshaft bushings are pressed in. Now, the crankshaft bores (iron) and the camshaft bores (bearing metal) are precision bored. Following this, the crankshaft bores are honed to provide for the best possible seating of the bearing inserts and also conduction of heat away from the bearings.

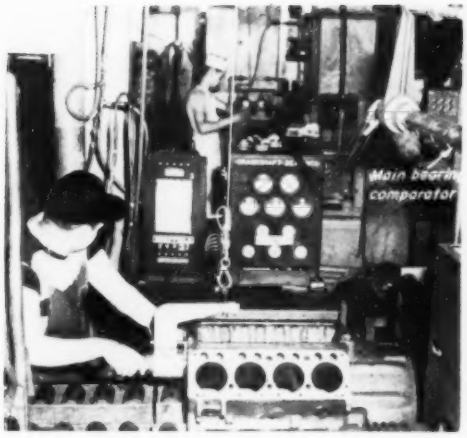
Inspection Procedures

To make certain that critical operations on the block are performed within quality-control limits, several types of air-gaging equipment are used.

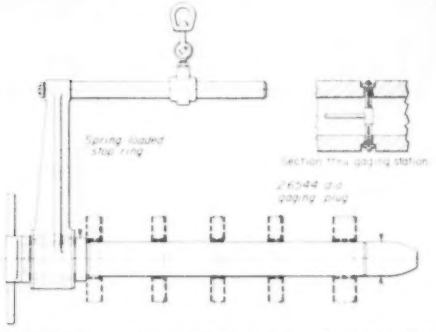
Cylinder bores are checked on a Sheffield "Precisionaire" machine, which is fitted with two roller tables on opposite ends, and an indexing fixture at the central gaging station. The roller tables have a translucent, illuminated screen that throws light from below into a bank of cylinders. Thus, the operator can visually check whether cylinder bores are scored, pitted, or have blowholes uncovered by machining.

After visually checking one cylinder bank, the operator rolls the block into the fixture, and engages a shot pin with the distributor shaft hole. Machined pads on the bottom of the block rest in guide rails. Hence, the block is aligned and squared up with four gage plugs fitted with carbide strips and air nozzles to check roundness, taper and size. By tripping a motorized unit, the gaging plugs are raised into the cylinder bores.

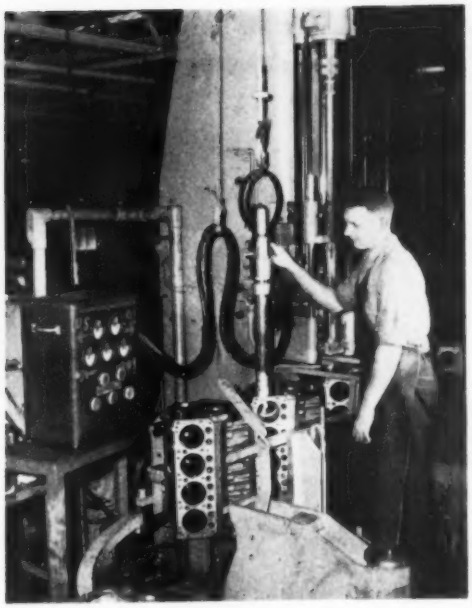
Sixteen Precisionaire tubes are located at eye level, so that the operator can see at a glance whether all bores are within prescribed limits. If they are, he proceeds to classify each cylinder bore for diameter so that pistons of like classifications can be selected for assembly with the bores. A manual stamping device is mounted above each bore. The operator reads the classification—*A* to *E* (3.8125 to 3.8145 by 0.0005-in. steps)—from



Camshaft bearings, after precision boring, are checked with a Sheffield bore gage. All bores are checked at one end, then opposite end, for diameter and taper



Main bearings, after precision boring, are checked with a Pratt & Whitney bore gage made 0.001 in. small. If gage will not enter all the way, alignment is poor



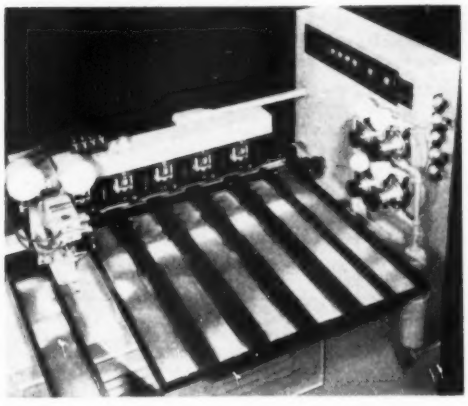
After honing, main-bearing seats are checked for diameter, out-of-roundness, taper and alignment with a Pratt & Whitney air-type bore gage

the upper scale, rotates the stamp spindle to the same classification and lets the stamp fall to mark the classification on the pan rail opposite the bore.

The fixture is now rotated 180° and the bores in the second cylinder bank are classified. After this, the block is released from the fixture and run out onto the second roller table for visual inspection of the interiors of the second set of cylinder bores.

This bore-inspection machine is located in the production line and is rapid in operation.

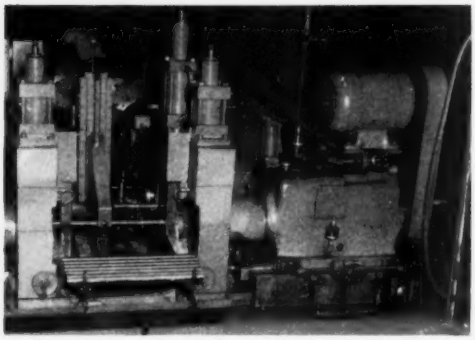
Piston Pins Segregated into Three Classifications

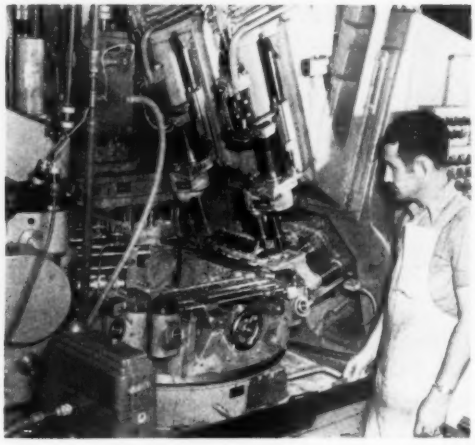


PISTON PINS are turned complete on an 8-spindle Conomatic, then ground and lapped on centerless Cincinnati equipment. After visual inspection, lapped pins are placed on a belt serving a Sheffield piston-pin classifying machine.

When the pins reach the proper machine position, they are crossfed individually by a finger to a station that rejects oversize pieces. Pins that pass this test are pushed through an air ring that checks diameter at both ends and the taper. The machine takes a reading, then energizes a gate at the chute for the proper size-classification tray. The gaged pin, pushed by incoming work, drops onto a belt, reaches the energized station, hits a stop and is wiped off into the chute. Tapered pins and undersize pins go into the proper chutes. Acceptable pins—those within a 0.0002-in. limit—are graded into three classifications, and placed into containers for movement to the assembly area.

Rocker Shafts Made on High-Production Machines





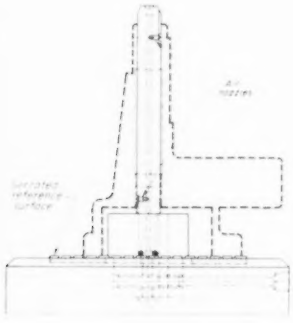
MINIMUM HANDLING is required to produce rocker shafts. Tubular stock is dropped onto the automatic feed table of a special Motch & Merryweather machine. In the rear position of this unit (above) the stock is fed out to length and cut off. The sawn tube rolls forward to V-blocks where it is caught and locked by air clamps. Side heads move in to counterbore and chamfer the ends. Shafts are then ejected and removed in tote box loads to centerless grinding. Ground shafts are brought to the 4-station Kreuger (right) where oil holes, oil grooves and locking grooves are produced. Straightening on a Kane & Roach machine involves passing shaft through rollers until run-out at bearing locations is within 0.004 in. This operation takes only a few moments.

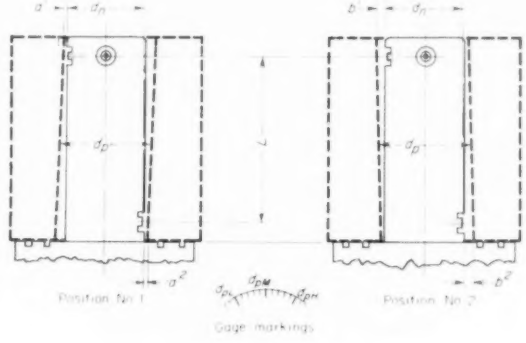
Oil-Pump Housing Checked for Face and Bore Squareness

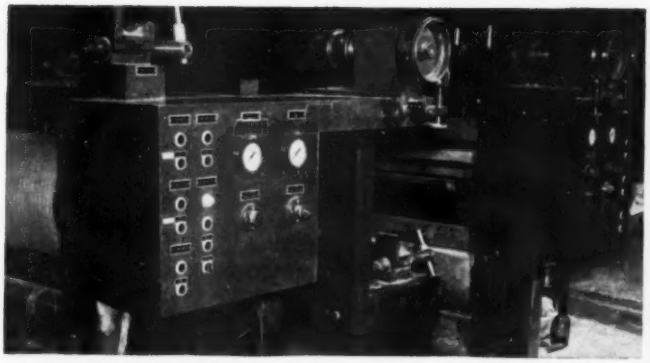
EFFICIENT OPERATION and long life of the oil pump are affected by the squareness of the shaft bore with the cover face. To check this relationship, the machined casting is placed over the air plug gage of a Taft-Peirce "Comp-Air-Ator" with the face resting upon the serrated-carbide reference surface. The air plug has two nozzles offset in the vertical plane. In effect, these nozzles check the bore diameter. However, if the bore is not perpendicular to the cover face, the readings of "effective" diameter will change as the part is revolved about the plug. Why this is so can be seen from schematic sketches of the part at Positions 1 and 2. Here a = minimum clearance (Position 1), and b = maximum clearance (when rotated 180° to Position 2). Besides:

d_p = part diameter
d_{pH} = part diameter—high limit
d_{pL} = part diameter—low limit
d_{pM} = mean part diameter

In distance L, the amount that the bore is out of squareness with the face is indicated on the dial of the comparator as $(b^1+b^2) - (a^1+a^2)$, as determined by rotating the part 180°. However, even when the part is square, the pointer reading varies as a function of d_s-d_p, since d_s is fixed and d_p varies from part to part. This variance is too small to exceed the d_{pL} and d_{pH} limits. Devices such as this remove need for skilled inspectors.







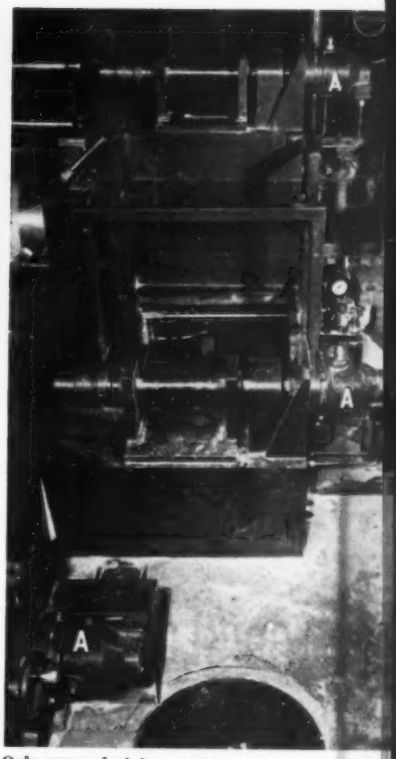
Hydraulic and electrical controls for ideal installation are in same panel, but are separated by wall. Valves are enclosed; piping goes through floor trench

10 STEPS TO PREVENT HYDRAULIC DISASTER

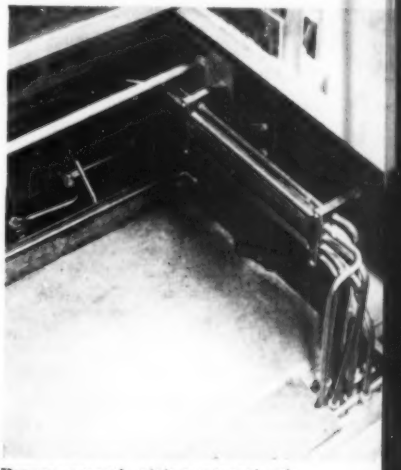
BY RANSOM TYLER, Engineer, THE OILGEAR CO.

Oil that serves hydraulic mechanisms and lubricates machine tools in the shop can only burn under certain conditions: It must be exposed to open air; and it must be exposed to a flame. Yet, oil fires are not uncommon; and they are a prime source of danger in the event of almost any kind of disaster. The ideal in oil lines—double conduit piping, underground routing, automatic warning devices, and flame-dampening equipment — is practical in only a few cases where new systems are being installed. Therefore, existing lines must be checked, repaired, and adjusted so they will provide the least danger.

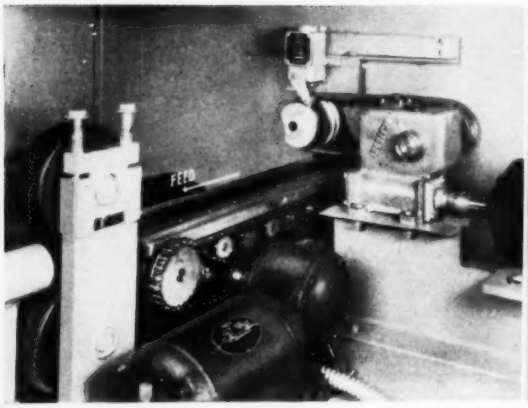
1. **Tighten up. Loose, vibrating lines are almost sure to break eventually because of work-hardening of the metal. Copper pipe should be utilized only for low-pressure applications (under 300 psi) in danger areas.**
2. **Check flexible hose. It is subject to wall rupture and coupling blow-out, and should be kept as short as possible and enclosed.**
3. **Replace fragile piping. Small-diameter lines should be protected by guards or by locating them where they cannot be hit.**
4. **Make good repairs. Piping changes should be planned so they won't have to be redone; should be done only with top-notch materials.**
5. **Replace overhead runs. Lines that must span long distances should be underground or inside walls.**
6. **Pack breakthroughs. Where pipes pass through walls or floors, the openings should be shielded with asbestos and closed up carefully.**
7. **Eliminate shock. Machine operations that cause line shock can be improved with proper valving.**
8. **Keep it simple. In designing new circuits, controls and valves should be at the power source, not branched all over the circuit.**
9. **Avoid overloads. New designs should be built extra large to handle additions.**
10. **Check workmanship. Threads must be sharp and tight; welding must be sound; and, above all, piping must fit without strain.**



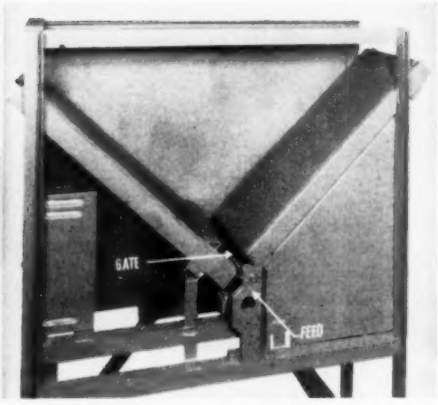
Only exposed piping at drive side of machine is three short lengths to motors (A). Floorplate covers central valve well to form operator's platform



Braces around piping prevent vibrations and simplify layout. Close-up is of valve well under operator's platform



Conveyor moves pipe faster than traction rolls, assuring constant supply. Upper roll is spring-loaded and has self-aligning bearing. Cam on gate shaft closes switch energizing valve controlling air cylinder on hopper. Cylinder forces hopper bottom down faster than it would drop by gravity. Up stroke also is rapid. These rapid actions assure one to three free-rolling pipes at bottom of hopper

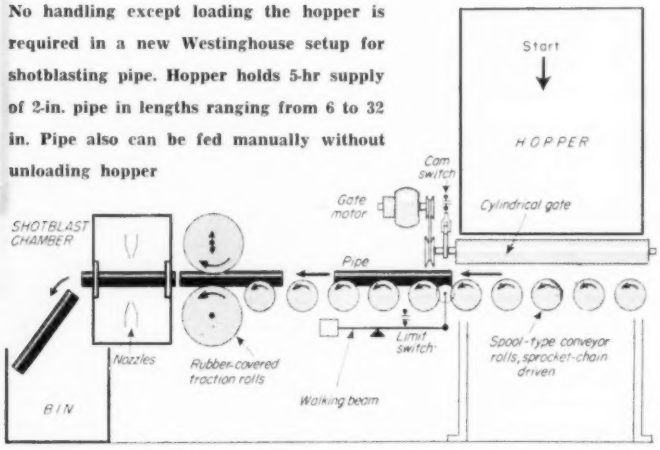


Hopper is V-shape with right side hinged at top and with bottom swung by air cylinder capable of lifting entire load in hopper. This action shuffles pipe, breaking arches that inherently form in stacked tubing. Triangular baffle is vital to shuffling and its size and location are critical. Shuffling action is controlled by cam on shaft of gate

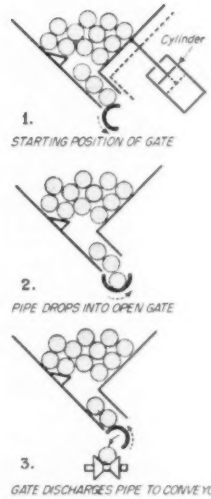
WORKLOADER MAKES SHOTBLASTING AUTOMATIC

By R. E. BLANEY, Foreman, Model Shop, Westinghouse Electric Corp., Buffalo, N. Y.

No handling except loading the hopper is required in a new Westinghouse setup for shotblasting pipe. Hopper holds 5-hr supply of 2-in. pipe in lengths ranging from 6 to 32 in. Pipe also can be fed manually without unloading hopper



Automatic shotblasting setup includes hopper with cylindrical-shaped gate that rotates to deposit one length of pipe onto spool-shaped, chain-driven conveyor rolls. These move pipe to traction rolls that feed pipe through shotblast chamber containing six nozzles radially positioned at equal intervals. Beneath conveyor is a limit switch actuated by a walking beam with roller on one end. Pipe moving over roller opens switch to stop rotation of hopper gate and to prevent delivery of additional pipe. When pipe moves past roller, switch closes to affect delivery of next piece. Shotblasting thus can be performed without operator attention



Rotating gate holds only one pipe at a time. To keep load off gate, hopper bottom normally is held in up position and is lowered only momentarily once per revolution of gate to drop piece into gate. When pipe has been discharged, limit switch under conveyor stops gate rotation until pipe moves past and next piece is required

ROUND TABLE

To Each His Own

"Listening to a song on the radio the other night gave me an idea, Ed, and I'm trying it out. Seems to be working all right, too—at least, thus far."

"Glad to hear, Al, that the radio gave somebody an idea. What was it, a smart way to get rid of your mother-in-law, or a plan for working on that new blonde in the front office?"

"Neither. This was a funny thing. I heard 'em singing, 'To Each His Own.' Now I've got a way to cut down the high cost of doing involved jobs."

"That's a rich one! From a love song to the shop. Can't say that I see any connection, unless you love your work, as the schoolbooks put it, Al."

"No, the idea is to split up the tough and costly jobs, having apprentices and helpers do the roughing out and leaving the fancy finishing to top-pay men. That way I use each man at what he can do best—and save money."

"The heck you do, Al! You'll have one of the kids hogging out and butchering a job, then having a good man spend twice the usual time trying to straighten it out. Nope, unless one man carries the job through, it gets all fouled up."

"Some of your tool jobs might, Ed, but not my rougher ones. There's a lot of work just cutting stock to size, taking rough cuts and such that a youngster can do—and get good training while he's at it. Then the trained man isn't bothered with the time-wasting and expensive roughing."

"And the kid never learns anything, while the old-timer gets to be a fancy pants, eh? Seems to me you spoil both types in jig time."

"No I don't, Ed. The youngsters have to learn, and it's better to have 'em learn on rough work that they can't ruin. Meantime, they get a chance to rub elbows with skilled men and that's a real help."

"If getting bawled out by everybody in the shop is your idea of rubbing elbows, Al, it is. But I doubt it. Besides, cutting off and roughing have been done by the stockroom for years."

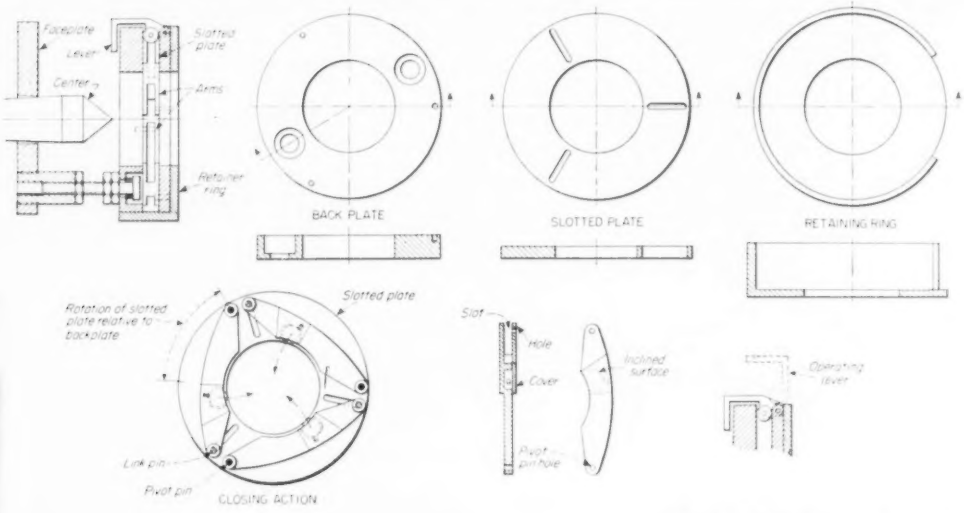
"Only taking off cutting burrs, Ed. This goes beyond that—to actual shaping. And I can, if the idea works out, sort of assign one or two younger men to each older one, and speed their training that way."

"Now you really are off base, Al. First, you dish out your authority to everybody else. Second, you put a lot of men at training youngsters who probably can't train a cat to go out. Nope, I'm agin the whole idea!"

"Well, Ed, 'to each his own', you know."

***CAN JOBS BE** successfully split by degree of skill? Is it unfair to apprentices? Your ideas and opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Driving Dog for Lathe Has Large Chucking Range

WORKING LIKE THE IRIS in a good camera, this dog has three arms with hardened gripping pads that can be adjusted to take many sizes of work. Built for a lathe with a 6-in. swing, for example, the dog will drive work with diameters from ¼ to 3 in. Having three gripping surfaces that will not twist, the dog has more strength and accuracy than the conventional type.

The device is built out from a faceplate, through which the lathe center protrudes to center the work. Two holes in the faceplate carry large posts, into which are assembled bolts that are held in position by locknuts. The nuts allow adjustment of the overhang of the dog, when this is desirable.

Two counterbored (from the tailstock end) holes take the bolt heads. Springs assembled under the bolt heads allow some play along the work axis, but the holes through which the bolts pass do not allow excessive twist.

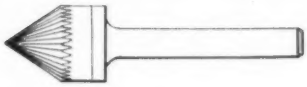
Simply a bored disk, the backplate has only three other small holes drilled into it. These are on the tailstock side, and are equally spaced around the plate at the same radial distance. The slotted plate is also bored to clear large work, and has only three equally spaced radial slots cut through it.

After assembly, the dog is fitted with a retaining sleeve that covers the whole works, being pressed onto the OD of the backplate. A sector spanning about 60° is cut out of the wall of the ring to clear the operating lever.

The dog works this way: Each arm has a pin at each end, but on opposite sides. One pin is a pivot pin, and fits into a hole in the backplate. The other fits a slot in the slotted plate. Between the pins the arm is recessed to take a small hardened-steel roller. This grips against the work, holding because of a flat cut in the back of each round recess. The openings of the recesses are smaller than the diameters of the rollers, so the rollers cannot fall out. Small compression springs inserted in blind holes behind the rollers keep them forward until they actually contact the work. For assembly purposes, each arm was cut away at the side so the spring and roller could be inserted; then a cover plate was added. The front (slot) end of each arm is yoked to clear the narrowed back (pinhole) end so the arms will not interfere with each other as the dog works.

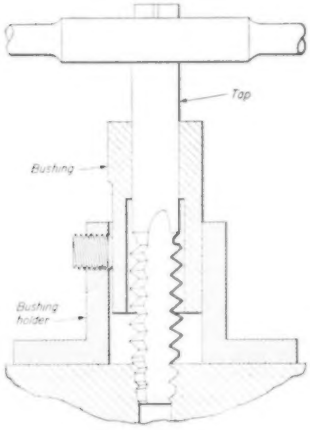
The pivot pins are driven into the backplate, while the slot pins work in slots in the slotted plate. Thus, when the slotted plate is moved in either direction relative to the backplate, the arms will expand or contract to take a larger or smaller diameter of work.

The operating lever jams the slotted plate and backplate together by means of a hardened round ball that slips between the two plates as the lever is pivoted down. In the up position, the lever releases the plates for relative motion, allowing adjustments. In the down position, the lever is against the front edge of the dog, and is out of the way. *William J. Constandse, Worcester, Mass.*



Carbide Burr for Descaling

AN IDEAL TOOL for removing scale and rust from heat-treated parts is a small carbide burr. It can be utilized before finish-turning or grinding is done. The burr can be operated with a ¼-in. electric drill. *J. M. Askin, Lufkin, Texas.*



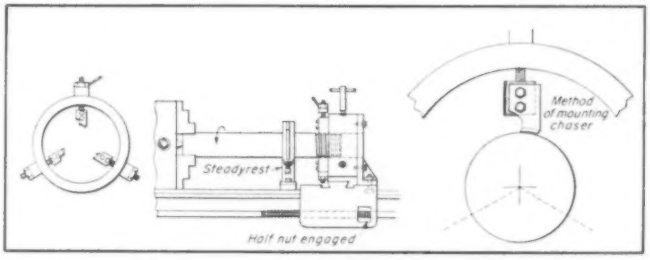
Holder Aligns Hand Tap And Controls Depth

OUR SMALL REPAIR SHOP has no bench tapper, so we often have trouble when tapping small-diameter, fine-pitch threads—especially in getting the tap started square with the work.

After some thought, we took a piece of 1½-in. cold-rolled steel ¾ in. long and turned a ¾-in. dia ⅝ in. long and bored a ½-in. hole through the piece. The bottom was faced square with the bore. A setscrew through a tapped hole in the wall was to hold bushings that would locate the taps.

Bushings to fit the ½-in. hole on their OD's and the various taps in their ID's were made with a flat down one side to seat the setscrew. This prevented rotation of the bushings. We bored the bushings part way up to clear the threaded portions of the taps, and we hardened them.

To set a bushing so it will control depth of cut, the tap is locked in the wrench after assembly into the bushing. The bushing is located in the holder with the tap extending the amount it is to enter the work, and with the bushing raised so its top edge butts against the tap wrench. The setscrew is tightened, and work starts. The holder need not be flat on the bottom, but may be cut at an angle to fit into a V-block. *A. F. Turner, Chicago, Ill.*



Chuck Jaws Are Threading Dies To Chase Large Shafts

ONE OF OUR CUSTOMERS, who makes earth-moving machinery, wanted some 4-tpi threads cut for several inches along a few winding-drum shafts. The threads were to control the limit nut for the winder-tripping mechanism.

The shafts were several feet long, and were too large in diameter to be cut by our largest self-opening dies. Ordinary methods of making special dies would have meant making a large tap-style hob or profile-grinding the dies on our optical-profile pantograph profiler—both methods being too expensive.

We figured it would be easier to tighten up the dies in their working position—or some approximation of it—and screw-cut them in the annealed state. After this we could harden and grind them.

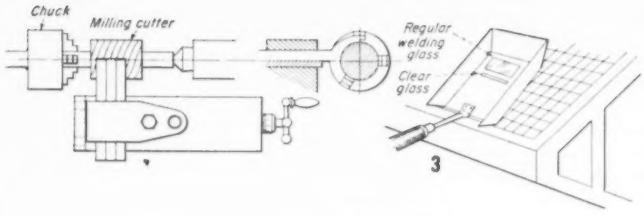
The setup was made with a 12-in., three-jaw chuck on a lathe; but three blocks, about the size of chuck jaws, were bolted to the chuck in place of the jaws. These were the die blanks.

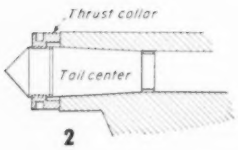
Each blank was fitted with a long stud assembled through a tapped ring that surrounded the chuck. Nuts on the ends of the studs were tightened to exert a pull on the jaws—thus taking out any backlash that might distort them when they were cutting later.

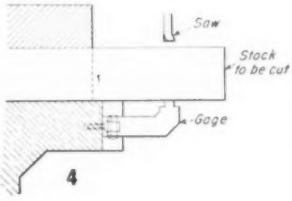
Jaw-forming was done conventionally with the jaws opened about a half inch larger than the diameter of the shafts. This allowed plenty of clearance. The die faces were not too wide, because the lathe leadscrew would control the pitch of the threads when the dies were later cutting the work. The cutting faces were tapered at the throat, as usual, and the edges were allowed to extend slightly past the center to prevent a poor thread because of tool spring.

After cutting the dies to within 1/16 in. of center, the dies were removed, hardened, replaced, and ground. They were given plenty of rake, and were backed off at the edges by offhand grinding.

Instead of taking the finished dies and driving them with the chuck from the lathe spindle, we located the chuck on an angle plate bolted to the saddle. We drove the shafts from the head, allowing the diehead we had built to support the outboard end of the work. The arrangement proved rigid and serviceable, as well as easy to operate because the diehead opened just like a chuck. *N. Palmer, Paddington, Australia*







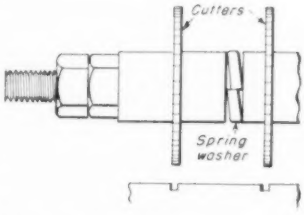
Four Tooling Ideas Speed Repair Work

CONCAVE-SECTION GROOVE KEYS can be cut without a milling machine and without filing by setting up a large milling cutter between centers on a lathe (1). The cutter is driven by the regular chuck, while the work is clamped rigidly on the toolslide, at right angles to the cutter axis, by a strap clamp. The cutter rotates in the usual lathe-spindle direction, against the pointed ends of the keys.

Tailstock centers, when jammed into tailstock spindles, can be more easily removed for replacement or adjustment when a threaded thrust collar is fitted to threads cut at the shoulder of the center (2). This allows the center to be loosened without removing the work from the lathe, for the tailstock clamp (that holds the casting to the ways) can be loosened, then the collar rotated with a pin wrench. This backs off the casting, and releases the center.

Slag can be removed from a welding job immediately after it has been welded without danger to the operator if a plain glass pane is inserted in the welding shield or hood below the regular filter glass (3). The operator only has to shift his hood or look through the lower part of the shield to have free vision. This makes safety glasses unnecessary.

A sawblade gage can be fitted to practically any kind of sawing machine to make it easier to check the length of stock you are to cut off (4). The hinged gage actually only locates the edges of the blade —both front and rear—and therefore may have to be changed when the saw is changed. For a given saw, however, the gage can be extended and measurements can be made from the edge of the gage to the end of the stock so suitable stops can be set. When stops are not utilized, the gage is that much handier. *Walter Lackner, Tirol, Austria.*

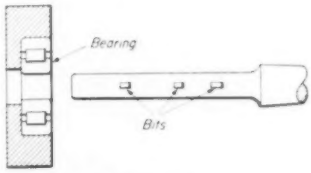


Filed Spring Washer Holds Arbor Compression

ON ONE OCCASION we had to make a number of shallow, parallel cuts in some workpieces. These cuts were to be the same dimensions—1/16 in. wide and 1/16 in. deep—but the spacings varied from piece to piece.

The milling arbor was rigged to allow quick adjustment of the space between the two thin cutters we used to do the milling. A 1-in. spring washer was taken, rounded off with a file on its sharp edges, and inserted on the arbor between two regular arbor spacers.

Because the cuts to be taken were light, we could tighten up on the arbor nut until the space between the cutters was just right, then lock the arbor nut with a locknut. Adjustment was simply a matter of loosening the locknut, tightening or loosening the arbor nut, then retightening the locknut. *R. C. Hoard, El Paso, Texas.*



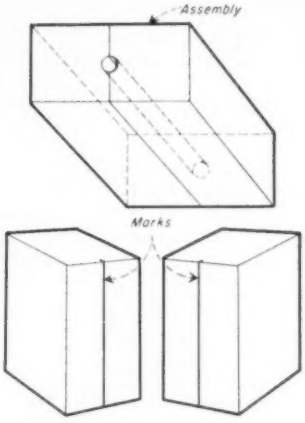
Headstock Roller Bearing Supports Boring Bar

AN ORDINARY ENGINE LATHE, because we had no turret lathe available, had to be utilized to bore out three concentric diameters in cast-iron, compressed-air injector-valve bodies. Overall length of the work was 6 in., and the diameters were 15/16, 1 1/16, and 1 3/8 in.

We first made a boring bar with toolbits inserted and with a tapered shank to fit the tailstock spindle. Carbide bits were spaced to cut the three diameters as the tailstock was advanced to the left.

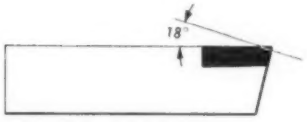
A plug was made to slip into the headstock spindle, and this was bored to take a roller bearing. The end of the boring bar was turned to slide closely into the bearing with a good slip fit, thus providing solid support for the end of the bar as the cuts were finished off.

Work was first drilled through, then bored with a spindle speed of 250 rpm. Accuracy was high, and finish was good. *G. W. Lippett, Evesham, England.*



Scribed Lines Pilot Small Drill

I RECENTLY had to drill a 1/16-in. hole between two 3-in. blocks of steel to produce a channel in each of the blocks. At first I had a lot of trouble with drill runout, but after deciding to scribe the drill path first, before clamping the blocks together, this trouble was eliminated. The scribed line in each block acts as a pilot hole and keeps the drill straight and true. *G. D. Carlsen, Manhattan Beach, Calif.*



Carbide Roughing Tool Ground Back at 18°

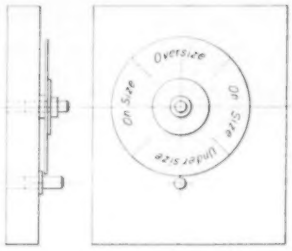
HERE IS my way of reducing the danger of chipping carbide lathe tools:

The top of the cutting edge is ground off at about 18°, providing a negative rake for a length of about 1/16 in. back of the edge. The tool is then mounted in an armstrong holder and set up in the lathe. The tool is then utilized for heavy, roughing cuts where normal vibrations often crack and chip the tool if not altered this way. *Don J. W. Tibbits, Whitefish, Mont.*

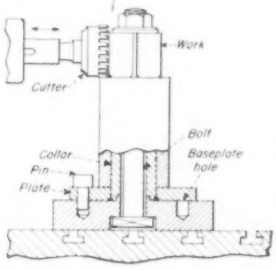
Eccentric-Disk Gage Checks Centerdistances

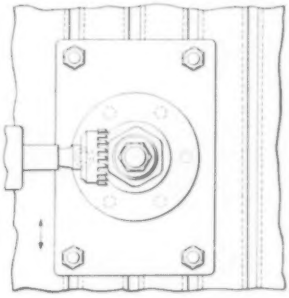
WE HAVE BEEN PRODUCING a series of two-hole castings in which the centerdistances vary from lot to lot. For each of four centerdistances we have developed a disk gage, used with go and no-go plug gages that check the hole diameters.

The disk is round, but is drilled slightly off center — the exact amount off center is slightly over the total tolerance on the centerdistance. Its diameter is twice the nominal centerdistance less the no-go diameter of the exposed plug gage.



Four lines are scribed on the disk: two where the radius is the smallest acceptable value, and two where the radius is the largest acceptable value. *Henry J. Gifford, New York, N. Y.*





Boring-Mill Fixture Grips Large Cylinders

HAVING TO MACHINE hex flats on the outside of a large cylinder, we tried to make a setup on a milling machine; but the work was too large. We did, however, manage to set up the job on a horizontal boring machine.

The fixture was built on a rectangular baseplate bolted to the table. Extending up through a hole in the plate was a sturdy bolt that was made immovable in the base. Over the bolt a collar-and-plate assembly, welded together, was fitted. The collar was counterbored to nest over a shoulder machined on the baseplate.

Six holes were drilled in the baseplate at equal spacings, and a hole was drilled in the round plate (attached to the collar) to take a pin that would key the collar-and-plate assembly to the base. Finally, the work was loaded over the collar, and a washer and nut were tightened to grip it firmly.

The table was locked so it could not travel toward or away from the cutter, but was reciprocated back and forth parallel to the cutter. After each cut, the nut was loosened, the pin withdrawn, and the assembly rotated until the pin could be slipped into the next hole in the baseplate. Then the fixture was tightened, and the next cut was made. Six such cuts were required for each workpiece.

Each face was cut with a single pass of the table. About 300 such workpieces were machined in this fashion without any difficulties. *M. Polak, Huddersfield, England.*

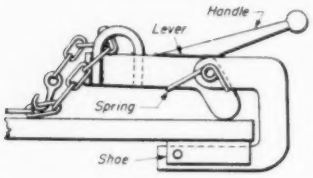
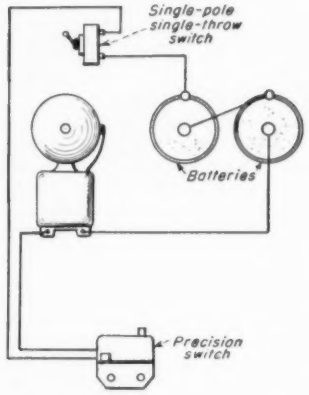


Plate-Lifting Hook —Simplified Again

WE USE A HOOK for lifting plates that is similar to the one described by Frank Butrick, Jr. (*AM* Apr 30 '51, p 120) and by H. G. Frommer (*AM* Nov 27 '50, p 132). Ours, however, has the addition of a pressing lever and spring.

This feature grips the plate or stock being handled, even while the hoist chain is not tight. It prevents accidental slipping, and simplifies attaching the hooks.

Special shoes, attached to the lower jaw and held by a pin, narrow or widen the jaw opening to make gripping of different plate thicknesses surer. The handle is for easier adjustment. *Haim Murro, Jerusalem, Israel.*

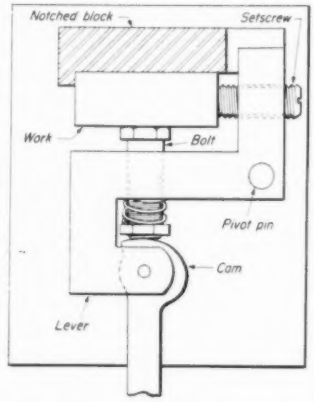


Alarm Rings When Cutoff is Done

A BANDSAW, hacksaw, or cutoff machine can be fitted with a simple bell system to warn the operator when a cut is about finished; thereby allowing him to use all of his time doing something else.

All you need is a couple of large dry cells, a doorbell or buzzer, a switch, and a precision switch; plus wire, of course. The circuit is a simple series one, with the precision switch controlling it after the ordinary switch is thrown.

The precision switch is located on a bracket in a position where it will be tripped when the machine has finished its cut. For example; it can be located under the cutting head, so when the head descends after the cut, the circuit will be energized and the bell will ring. *Fred Lettino, Astoria, N. Y.*



Drill Fixture Clamps Two Ways

FOR DRILLING HOLES in rectangular pieces, a fixture with a double-acting clamp lever and a quick-acting clamp has proven to be fast.

The fixture base is fitted with a notched block, welded or bolted in place, to locate the work. Opposite the block is a pivot pin, around which the clamp lever works. One clamping point is a setscrew; the other is a bolt backed up by a quick-acting cam clamp. These are adjusted when the first setup is made, and thereafter the only action necessary is to operate the cam arm.

The bolt, which is assembled through a hole in the L-shaped lever, is spring-loaded to retract it as soon as the cam is released; thereby allowing the work to be easily taken from the fixture. *Thomas F. Ormsby, Longview, Texas.*

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An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES— A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS— Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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HOW TO ENTER – Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

132nd Winner:
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M. Yamaguchi

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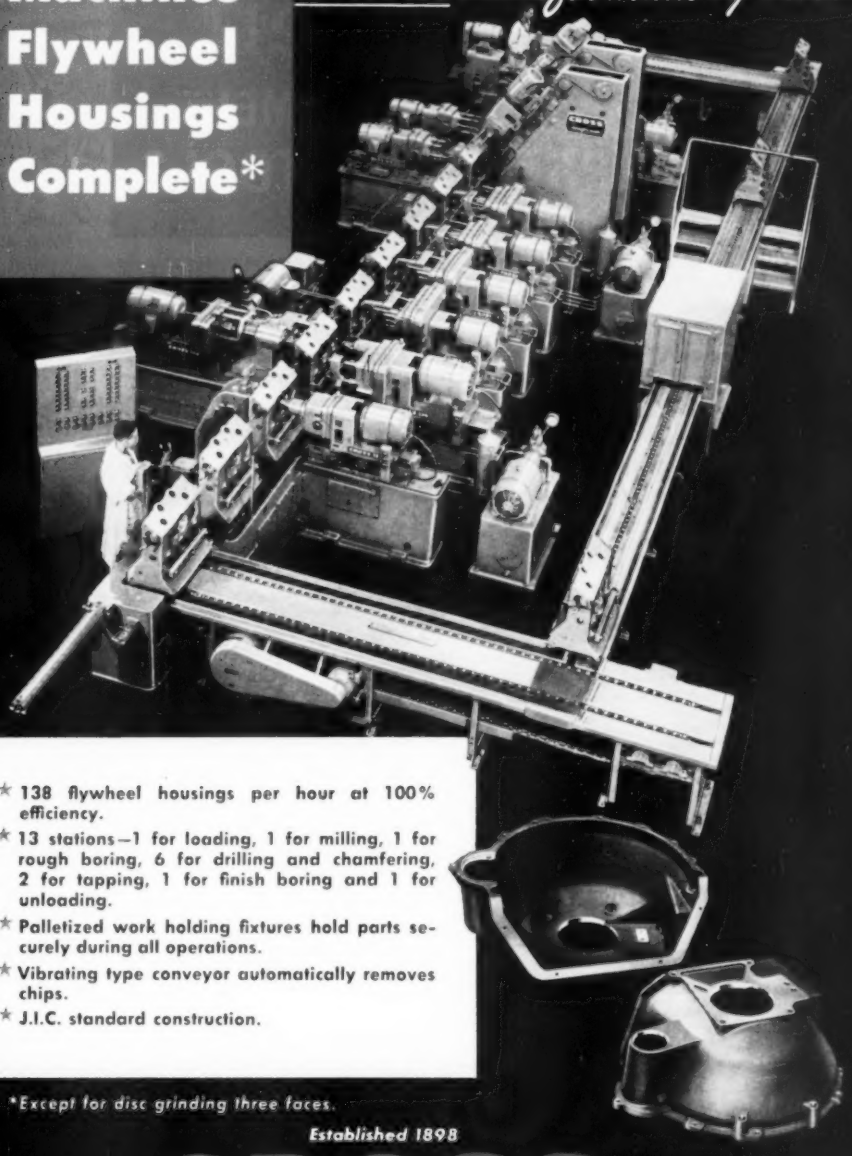

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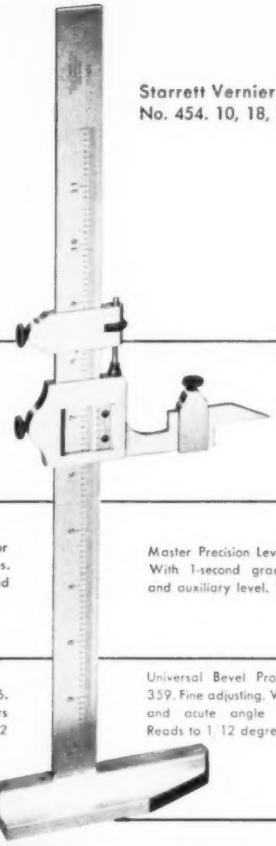
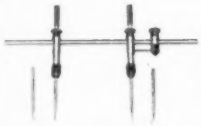


Starrett Vernier Height Gage No. 454. 10, 18, 24 inch sizes.

Starrett Vernier Caliper No. 122. 6, 12, 24, 36 and 48 inch sizes.

Starrett Gear Tooth Vernier Caliper No. 456. Two sizes: 20-2 and 10-1 diametral pitch. Also in Metric.



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American Machinist

REFERENCE BOOK SHEET

Silver Brazing of Nickel Alloys—I

Courtesy International Nickel Co., Inc.

NICKEL and the high-nickel alloys can be joined readily by silver brazing. As compared with other metals, there will be certain changes in procedure necessitated by the different chemical, mechanical and physical properties of the alloys being joined. It is imperative to determine: strength of joint at the service temperature, corrosion resistance of joint in the specific application, or purity of product requirement.

Cleanliness

Molten brazing alloys will adhere only to chemically clean metal and not to oxides of metals, dirt, carbon, or other foreign material. Therefore, it is important that oxides and all foreign material be removed from parts which are to be brazed or soldered. Fluxes for use in brazing operations are designed to prevent the formation of oxides during the heating period, and to remove slight oxides formed after cleaning and before brazing.

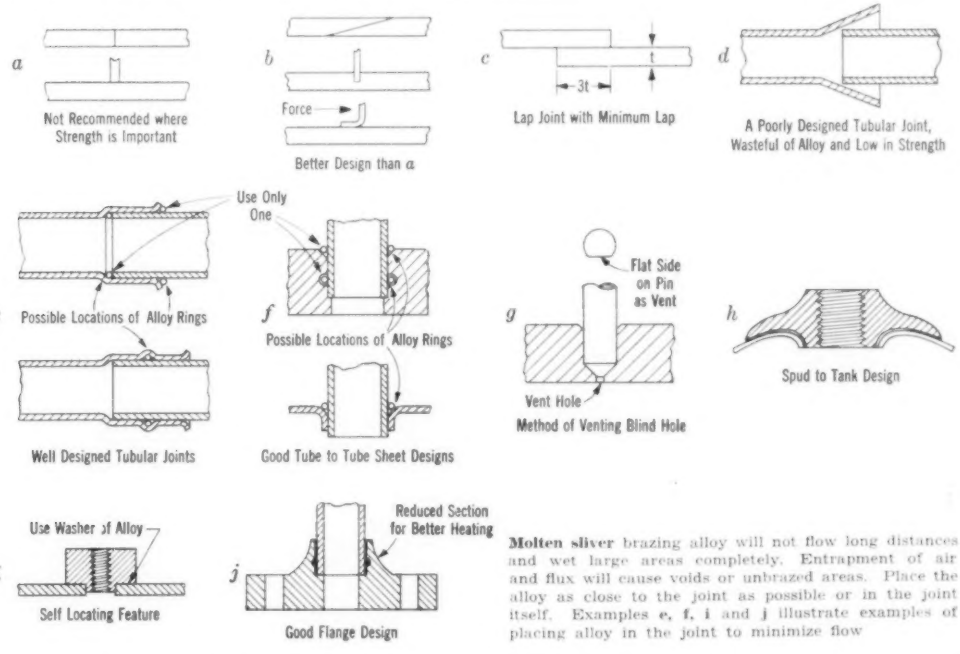
Nickel alloys are subject to attack by sulfur and low-melting point metals, particularly lead, at elevated temperatures. Material which has been embrittled by sulfur or lead cannot be salvaged. It must be scrapped. Before proceeding with any heating operation which involves temperatures over 700 F, such as brazing, welding, or annealing, all foreign material which might contain sulfur or lead must be removed. Such substances as oil, grease, paint, marking pencils, drawing or cutting lubricants, and others contain enough sulfur or lead to cause embrittlement of nickel at brazing temperatures.

Oxides will not be removed by degreasing alone. They may be removed by chemical pickling, or by mechanical means such as grinding, emery cloth, or blasting with sand or grit. Wire brushing is not satisfactory because the oxide films on nickel alloys are tenacious and will not be removed.

SILVER BRAZING

SILVER BRAZING ALLOYS may be used to join nickel and high-nickel alloys to themselves or to many other metals and alloys other than aluminum and magnesium and their alloys. When properly applied, silver-brazed joints will develop the full strength of annealed material and will be economical as compared with other methods of welding.

Continued on p. 173



Molten sliver brazing alloy will not flow long distances and wet large areas completely. Entrapment of air and flux will cause voids or unbrazed areas. Place the alloy as close to the joint as possible or in the joint itself. Examples **e, f, i** and **j** illustrate examples of placing alloy in the joint to minimize flow

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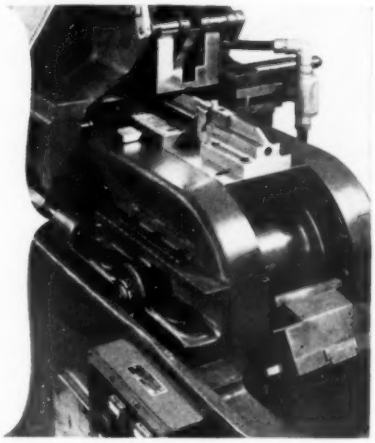
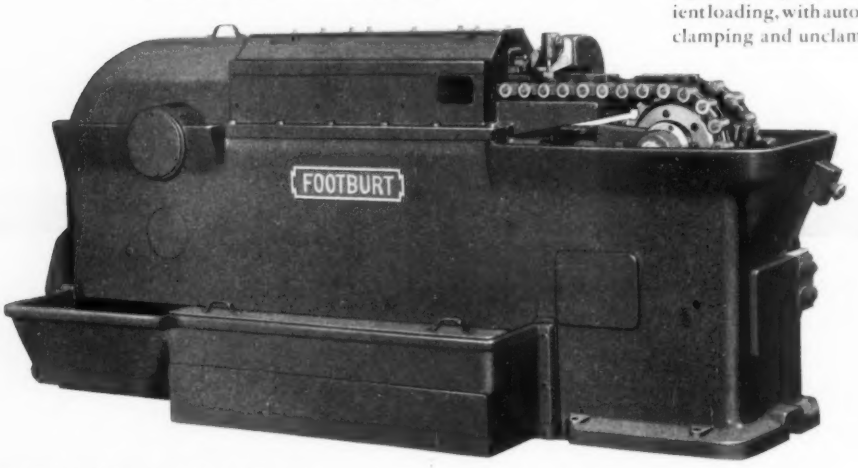


• Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



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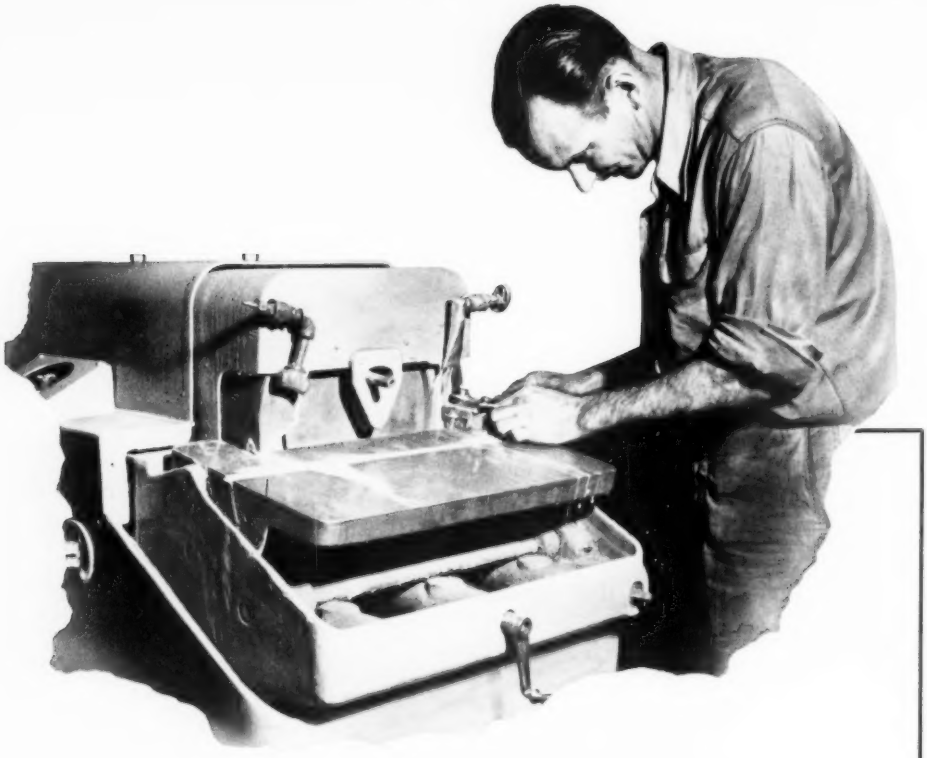
Silver Brazing of Nickel Alloys—II

COMPOSITIONS, TRADENAMES AND SPECIFICATION NUMBERS OF SILVER BRAZING ALLOYS

No.	Composition				Comparable Trade Names			Solidus (Melting Point, °F.)	Liquidus (Flow Point, °F.)	A.W.S. Designation	Specification Source and Number					Federal Spec. QQ-S-561d	S.A.E. Aeronautic Material Spec.
	Silver	Copper	Zinc	Others	American Platinum Works	Handy & Harman	United Wire Co.				A.S.T.M. B-73-29	U.S. Navy 47-S-13d	U.S. Army 57-97-1	U.S.A. Chemical Warfare Service 196-131-80	U.S.A.F. 11342		
1	5	58	37	...	...	TE Special	...	1,575	1,600	...	...	...	...	...	...	...	...
2	6	86½	...	7½ P	...	...	Phoson	1,175	1,350	...	...	...	...	...	...	...	...
3	7	85	...	8 Sn	...	SN No. 7	...	1,735	1,805	...	...	...	...	...	...	...	...
4	9	53	38	...	Silvaloy A-4	TL	...	1,450	1,565	...	1	...	...	...	...	...	...
5	15	80	5	...	...	...	Sil-Lo	1,185	1,445	...	...	...	...	...	...	...	...
6	15	80	...	5 P	Silvaloy 15	Sil-Fos	...	1,185	1,300	BCu P-3	...	III	...	3	A	3	...
7	20	45	35	...	Silvaloy A-11	AT Special	...	1,430	1,500	...	2	0	...	0	...	0	...
8	20	45	30	5 Cd	Silvaloy 20	ATT	...	1,140	1,500	...	3	...	...	...	...	...	...
9	25	52½	22½	...	...	NE	...	1,500	1,575	...	...	...	...	...	...	...	...
10	30	38	32	...	Silvaloy A-13	NT	...	1,370	1,410	...	...	...	...	...	...	...	...
11	31½	34	15½	19 Cd	...	...	Sil-Oid	1,165	1,390	...	...	...	...	...	...	...	...
12	34	27	18	21 Cd	...	...	...	1,125	1,300	...	...	...	...	...	...	...	...
13	35	26	21	18 Cd	Silvaloy 35	Easy-Flo 35	Sil-Aid	1,125	1,295	BAg-2	...	...	VIII	...	...	...	...
14	40	36	24	...	Silvaloy A-14	DT	Sil-Een	1,330	1,445	...	...	...	...	...	...	...	...
15	40	30½	29½	...	...	...	...	1,150	1,350	...	...	...	...	...	...	...	...
16	40	30	28	2 Sn	...	...	Sil-Nik	1,240	1,435	...	...	...	...	...	...	...	...
17	40	30	28	2 Ni	Silvaloy 250	SS	...	1,220	1,435	BAg-4	...	...	...	...	...	...	...
18	40	18	15	27 Cd	Silvaloy 40	...	...	1,135	1,205	...	...	...	...	...	...	...	...
19	45	30	25	...	Silvaloy A-18	DE	Sil-Tite	1,250	1,370	...	4	1	...	1	...	1	...
20	45	15	16	24 Cd	Silvaloy 45	Easy-Flo 45	Sil-Bond	1,125	1,145	BAg-1	...	...	VII	...	...	...	...
21	47	20	17½	15½ Cd	...	...	...	1,165	1,240	...	...	...	...	...	...	...	...
22	50	34	16	...	Silvaloy A-25	ETX	Sil-Gon	1,275	1,425	...	5	...	...	...	...	...	...
23	50	28	22	...	Silvaloy A-28	...	...	1,250	1,340	...	...	...	...	...	...	...	...
24	50	15½	16½	18 Cd	Silvaloy 50	Easy-Flo	Sil-Ex	1,160	1,175	...	...	IV	...	4	B	4	AMS4770
25	50	15½	15½	16 Cd. 3 Ni	Silvaloy 503	Easy-Flo 3	Sil-Fil	1,170	1,270	BAg-3	...	V	...	5	...	5	...
26	56	22	17	5 Sn	Silvaloy 355	...	Sil-Tin	1,145	1,205	BAg-5	...	...	...	...	...	...	...
27	60	30	...	10 Sn	...	RT-SN	...	1,095	1,325	...	...	...	...	...	...	...	...
28	60	25	15	...	Silvaloy A-33	RT	Sil-Tex	1,260	1,325	...	...	...	...	...	...	...	...
29	65	28	...	5 Mn. 2 Ni	...	RE-Mn	...	1,385	1,445	...	...	...	...	...	...	...	...
30	65	20	15	...	Easy	Easy	Sil-Loy	1,235	1,310	BAg-7	6	II	...	2	...	2	...
31	70	20	10	...	Medium	Medium	Sil-Co	1,235	1,360	BAg-8	7	...	...	...	...	...	...
32	72	28	...	...	Silvaloy 301	BT	Sil-Utec	1,435	1,435	BAg-6	...	...	...	...	...	...	...
33	75	22	3	...	Hard	Hard	...	1,365	1,450	BAg-9	...	...	...	...	...	...	...
34	75	20	5	...	...	Hard No. 1	...	1,350	1,425	...	...	...	...	...	...	...	...
35	75	...	25	...	...	TR No. 1	...	1,300	1,345	...	...	...	...	...	...	...	...
36	80	16	4	...	Silvaloy A-49	IT	Sil-80	1,360	1,490	...	8	...	...	...	...	...	...
37	85	...	...	15 Mn	Silvaloy 850	...	...	1,745	1,760	...	...	...	...	...	...	...	...

*From the Welding Engineer, August, 1950.



HOW TO GRIND CARBIDE-TIPPED TOOLS WITH ROBERTSON WHEELS

Are chipped and cracked carbide-tipped tools a common complaint in your shop? Are your grinding wheels wearing out too fast? Here are two "tips" on grinding which Robertson engineers have found very helpful in conserving both tools and wheels.

The grinding of carbide tools by applying heavy pressure against the wheel is extremely harmful. Actually, grinding is accomplished much faster, and with much more satisfactory results, by passing the tool slowly across the face of the grinding wheel with a light, uniform pressure. This results in fewer wheel dressings, making for longer wheel life, and eliminates chipping and cracking of tips.

Grinding both the shank and the carbide tip at the same time glazes the grinding wheel and generates excess heat causing the wheel to lose its free-cutting action. This will also chip or crack the tip and tend to loosen it in its setting. These faults are overcome by undercutting the shank about 2° more than the carbide tip.

Robertson Cool-Cut wheels for grinding carbide-tipped tools range from 6" x 1" up to and including 14" x 4" x 11", all plate-mounted.

Highly satisfactory results have been obtained using our GC60-I-2V for roughing operations and our C120-HV for finishing operations. For the best results from any grinding operation, make sure your grinding wheels are Robertson Cool-Cuts . . . the wheels that are precision-built for the toughest jobs.

ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING CO.
TRENTON 5, NEW JERSEY

RESIN-BONDED AND VITRIFIED-BONDED GRINDING WHEELS • MOUNTED WHEELS • SEGMENTS

Silver Brazing of Nickel Alloys—III

The goal in any joining process is to obtain a leak-tight joint approaching 100% efficiency. When designing with silver brazing alloys which have a tensile strength in the order of 40-50,000 psi, there are two approaches to the problem of obtaining high joint efficiency.

One approach is to obtain the highest unit strength possible in the joint. When maximum unit strength is important, the fit of parts should be maintained between 0.0005- and 0.003-in. clearance. A more realistic approach is to accept a lower unit strength, but to increase the lap or joint area to at least three times the thickness of the thinner member. This allows some tolerance in clearances and some mechanical defects like flux inclusion and incomplete brazed areas without lowering the joint efficiency.

Importance of Fit-up

In any event, the fit of parts should be maintained so a clearance between 0.0005 in. min. to 0.006 in. max. exists. Wider clearances can be tolerated but are wasteful of alloy, and frequently require an alloy with less fluidity when molten to fill the clearance.

In the joining of dissimilar metals, clearances must be considered at the melting temperature of the brazing alloy and not prior to heating.

When extreme accuracy of position is important and clearance for the brazing alloy does not produce adequate accuracy, it is helpful to employ a straight knurl. The male part is machined to correct clearance size, then a straight knurl is employed to raise the maximum diameter to obtain a press fit with the hole, but still allow space for the alloy to penetrate.

When a part is inserted in a blind hole and brazed, or when a completely closed container like a float is to be brazed, a vent should be provided to allow air and gases from the flux to escape. Wherever possible the design should include self-locating features in the parts to be assembled.

Sometimes cracking of nickel and the high-nickel alloys is encountered in the presence of molten silver brazing alloy when the joint area is under stress. Cracking occurs almost instantaneously at the brazing temperature, and is readily detected. The age-hardenable alloys "K" Monel and Inconel "X" are more susceptible to such stress cracking than the solid-solution high-nickel alloys.

It is advisable to anticipate the probability of stress cracking and to eliminate the cause by eliminating the stress. Hard tempers or material cold formed to shape can contain sufficient stress to cause cracking in the sliver brazing operation. In general, silver brazing should be done only on annealed material.

To Avoid Stress Cracking

Stress cracking has been eliminated by:

(a) Using annealed rather than hard-temper material.

(b) Annealing cold-worked parts before brazing.

(c) Removing the source of externally applied stress by examining the assembly, the fixture or fit of parts.

(d) Heating at a slower rate (heavy parts particularly).

(e) Using a higher-melting-point alloy and thus obtain some stress relief of the material before the alloy melts.

(f) Heating the fluxed and assembled parts in a torch-brazing application to a high temperature (1600 F) and then cooling to the application temperature of the alloy before applying the brazing alloy which may be a lower-melting-point alloy.

(g) Using an alloy not containing cadmium such as alloys Nos. 22, 28 and 29 in table, page 171.

Hand feeding is satisfactory for torch brazing.

Silver Brazing Alloys

Alloys 13, 20 and 24 in the table are low-temperature, silver-brazing alloys and are the most commonly used commercial alloys with nickel and the high-nickel alloys. In special cases other alloys will be found to be very useful. For corrosive environments, an alloy containing at least 50% silver is preferred. Alloys 26, 27 and 29 are useful for applications where stress cracking might occur. Alloys 28 and 30 are good color matches to white materials like Nickel, Monel and Inconel; however, they will oxidize differently in service than the base material. Alloy 25 will fill wide clearances and produce large fillets.

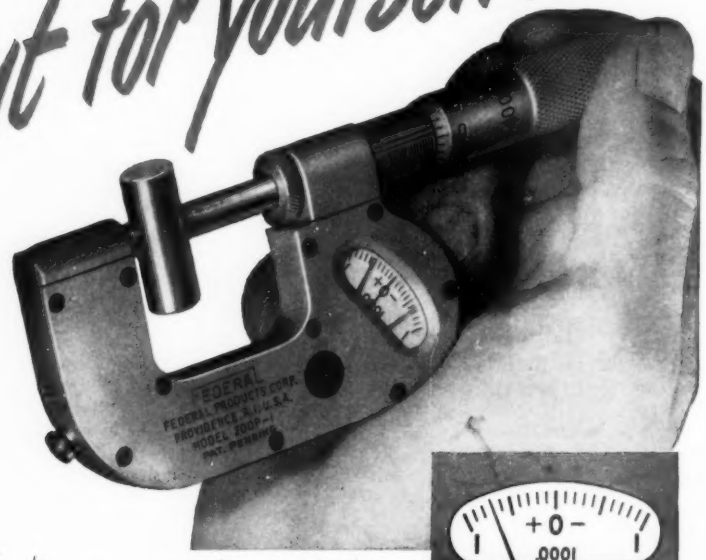
Alloys containing phosphorus such as 2, 6 and a copper alloy containing phosphorus but no silver (Phos-Copper) should never be used on any nickel alloy nor should they be used on any ferrous alloy.

Silver Brazing Fluxes

Fluxes for use with silver brazing alloys are specially compounded mixtures of flourides and borides which melt below the melting temperature of the brazing alloy, clean the surface prior to alloy flow, prevent oxidation of the alloy or surface during the brazing cycle, promote fluidity of the alloy, and cause it to wet the surfaces being brazed. Borax must not be used as a flux.

Standard fluxes are used on most materials not containing aluminum. Special fluxes are available for use with aluminum-containing materials such as "K" Monel, Duranickel and Inconel "X".

Find out for yourself....



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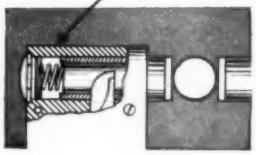
You've used regular "mikes" for such a long time you'll be amazed at the downright accuracy and plain honest-to-goodness convenience you can get with this CONSTANT PRESSURE, INDICATING MICROMETER. Just try it and you'll know why so many are buying it!

You'll discover the Federal MIKEMASTER has more worthwhile advantages than any other micrometer. It's the first really new micrometer made in this country in years. Once you've used it you'll recognize its superior accuracy — and you'll appreciate the convenience of reading an indicator instead of barrel graduations. You'll see how easy it is to check out-of-round and taper, too. You'll find its "repeat" accuracy matches some of your laboratory gages even though it sells for so much less money.

You'll also be pleased with the usefulness of the pushbutton Retracting Anvil and the Tolerance Hands when measuring duplicate parts. You'll find extra value in the *lapped*, Tungsten Carbide Anvils — and you'll just naturally like its nice balance and its *rust-proof*, dull chrome finish.

You don't have to take our word for it. Find out for yourself. Ask to see the Federal MIKEMASTER . . . and to try it on your work. Write to Federal Products Corporation, 1129 Eddy Street, Providence 1, R. I.

You'll appreciate the convenience of reading the Indicator instead of barrel graduations. The *constant pressure* of the anvil means constant measuring pressure every time.



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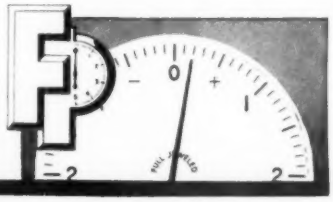


TALKING SHOP

Forge Pattern?

WE WONDER if the individual "brother," who is simply hoping for a few more benefits, is as aware of the forgings-strike pattern as is the subversive element conditions suggest may inspire it? Alco, Dow, Adrian, and similar plants—a sharp blow to critical forgings production. Is this coincidence, or a planned chain of events to weaken an important factor in defense production?

Draft Transfer

THE RECENT RULING which makes it possible for an employee to transfer his Selective Service records from one Local Board to another when he moves will save a tremendous amount in money *and* headaches. During WW II, one large company had to deal with 7000 Local Boards and, understandably, required a large staff just to handle this.

Safety Time

EVERYBODY looks at the clock, so Dominion Bridge Co., Canada, has capitalized on this human weakness to promote its safety program. All shop clocks have a large notice under them: "Safety knows no quitting time."

Diggers' Hat

THE AUSTRALIAN ARMY HELMET, similar in shape to the U.S. World War I helmet, has found a new application. Broken Hill Proprietary has bought quantities from surplus army stocks and resold them to workers at cost to provide greater eye and face protection for blast-furnace workers. The wide brim forms an excellent shield against particles flying from above, but does not obstruct vision.

Cast Stainless Chain

INVESTMENT CASTING produced stainless-steel links for a rather unusual chain in a high-speed can-filling machine made by E. H. Carruthers Co., Warrenton, Ore. The machine compacts tuna loins in cylinders and cuts them to can-size lengths, then puts them in the can. Each chain link is really a concave cylindrical face with chamfered edges, with two sockets on the back for pins carrying flat links that join the forming links. Two chains meet along a line to create the circular pressing shape. Link shape was complex and material tough to machine, so investment casting did the job, producing smooth surfaces that required little machining.

Fish Radiate?

100 POUNDS of Columbia River salmon, caught just below the Hanford Plutonium plant in Washington State, would have to be eaten by an individual at a single sitting if he would accumulate a noticeable amount of radioactive material from operation of the plant. GE vp George R. Prout, manager of the Nucleonics Dept, which operates the plant, reports that 4,000 water, 12,000 air and 900 well (seepage) samples are taken each year to be sure the area is kept clear of radioactive materials.

Daffynitions

MAN OF PROMISE: large debtor . . . VERTIGO: pre-vacation subject . . . KANSAS: state bounded by jack-rabbits . . . KLEPTOMANIAC: person who helps himself because he can't . . . SPORT ROADSTER: love seat on wheels . . . GARDENER: man who weeds 'em and reaps . . . DIET: parting of the weighs . . . YOGURT: pause that defleshes . . . MOST ONEROUS TAX: excess prophets . . . ARTIFICIAL RAIN: guided drizzle . . . CANDLEMAKER: fellow who works on wick ends . . . PUBLIC OPINION: what people think people are thinking . . . DETOURS: highwaymen mending their ways . . . MAKEUP: what girls did after kissing, now do before.

Doubling Tool Life

INCREASING relief angles to 12 or 15° will apparently double tool and cutter life and permit double the usual feed on materials like Nemonic steels for jet turbines, according to tests by Walden Sinawski of J & L. These results back up the report from England recently in *AM*.

Softness of Youth

ONE MANUFACTURER, engrossed with the intricacies of machining titanium, reports an additional problem: Production schedules declined from day to day even though machine operators gained familiarity with the material. Then they found the answer. Titanium age-hardens in storage; gets progressively more difficult to machine as each day passes. We wonder if the problem could be solved by treating just before working—as was found necessary for certain aluminum alloys years ago?

Ladies: Be Gents!

CERTAIN MALE AIRCRAFTERS at Pratt & Whitney Aircraft have at last rebelled against being beaten to the punch by the recently added female contingent. The gals, it seems, converted the time-card "dunk" line into a chaotic shambles. By bargain-counter tactics, they jostled the boys out of line, broke the line, and used such techniques as the "handbag elbow," "nylon-counter nudge," and the "elevator crush." The men are now standing firm and insisting on lineups regardless of pulchritude, with the adjuration, "Ladies! Be Gentlemen!"

News of Metalworking

McGraw-Hill WORLD NEWS

• **MACHINE TOOL SHOW IN PARIS**—Manufacturers from more than 12 continental European countries, plus Britain and the US, participated in the Paris Machine Tool Exhibition which opened Sept. 1, organized by European Cooperation Committee for Industry & Machine Tools. More than 2000 machines were displayed. A full story on the show will appear in *AM* in October.

• **INDIAN IMPORTS HIGH**—India's imports of machinery reached a value of 844-million rupees for the year 1950-51, ending March 31. Britain was the leading supplier, with shipments for 520-million rupees, followed by the US, 140-million rupees, and Czechoslovakia, 14.6-million. Largest machinery item was for prime movers. Machine tools to a value of 25-million rupees were imported.

• **AUSTRIAN EXPORTS DOUBLED**—Exports of machinery from Austria during the first half of 1951 amounted to 20,662 tons valued at 510.4-million schillings, more than double 1950's figures of 10,000 tons and 212-million schillings. Czechoslovakia was the chief importer at 79.5-million schillings; then Poland, 57.13-million; western Germany, 37.88 million; and Yugoslavia, 36.35 million schillings.

• **PRODUCTIVITY TEAM HERE**—France's 100th Technical Assistance Team, representing the machine tool accessories industry, is now in the US to visit tool plants at New Haven, Detroit, Chicago, Cincinnati, and Baltimore. The group is headed by Andre Royer, a director of Mecano, Paris, manufacturer of drills and reamers.

• **NEW GUN-TRACTOR** — Van Doorne Car & Trailer Co. of Eindhoven, Netherlands, has designed a medium gun-tractor with six driven wheels. Draw-bar pull is about 3 tons, enough to carry a 105mm howitzer cross-country with its 11-man team, about 1½ tons of ammunition, and full equipment. The tractor can maintain a road speed of 37.43 mph.

How Much Metal for Defense?

WASHINGTON — With important segments of industry skeptical of the need for full-fledged CMP controls, mobilization planners are trying to determine conclusively how much metal the defense effort takes.

They have to find out to answer steel producers' effective argument that the direct military take is running less than 10% of supply and therefore a CMP is not needed to distribute the entire output.

Metals allocators haven't been able to answer that argument except in unconvincing generalities. And now allocations are coming under two new attacks: Walter Reuther and CIO are pressing for more metal for autos and other civilian goods, and the Senate Small Business Committee says the CMP way of handing out metal is hurting the people it speaks for.

Planners think the one answer for all this anti-controls buildup is to show that mobilization is taking more metal than they can now prove.

• **There's no arguing** about the amount of metal allocated directly to the military and the defense supporting industries. That is announced for each quarter. What the planners can't prove is how much additional metal is used for weapons and defense industries in the form of components and MRO supplies.

They're sure it's a lot. One method of estimating (see table) shows that for every two tons of steel allocated directly, another ton is drawn into mobilization indirectly. This raises the mobilization take roughly a third over any figures ever released by NPA.

• **Take weapons.** Carbon steel allocated directly to the Dept. of Defense for the fourth quarter is only 8.5% of supply. Add in AEC and a little that goes to the Secretary of the Army and you still have only 10% of the supply. But the planners can't prove how much additional steel goes into weapons as small motors, compressors, bearings.

The military is not allocated materials for these. They are made as Class B products under CMP and get separate allocations. NPA knows how much steel goes into components in general. But they can't say for sure how much steel goes into the components purchased for weapons.

They're sure what the answer will be. Weapons and the defense supporting industries take about 36% of direct steel allocations. That is 7,720,000 tons in the fourth quarter.

Urgent need for machine tool delivery is emphasized by Reid Brothers Co., Inc., Beverly, Mass. Here a production lathe weighing 2½ tons commences its night air delivery to Cleveland from Boston airport. The following day the lathe was working at the customer's plant on one of the operations in manufacturing 105-mm shells.

Mobilizers Seek Answer

Mobilization Program	Direct allocation of steel (tons)	Indirect take in components and MRO	Total use (Col 2 plus Col 3)	% of total use to steel supply
1. Weapons	2,162,037	1,285,400	3,447,437	16.
2. Power and fuel	2,139,426	1,285,400	3,424,826	16.
3. Transportation	2,113,425	1,285,400	3,398,825	16.
4. Construction	588,000	347,000	935,000	4.5
5. Minerals	41,395	25,708	67,103	.3
6. Export	676,000	398,474	1,074,474	5.
TOTAL	7,720,283	4,627,382	12,347,665	57.8

Total steel supply mentioned in column 5 is 21,336,000 tons: this is tons of finished products as allocated by CMP.

If they also take 36% of components, it means they will be using an additional 4.6 million tons of steel. This means that weapons and defense supporting industries will take 58% of the steel next quarter. It's this jump which planners think will be the clincher for continued controls.

• **Above is the table** which shows the fourth quarter direct allocations of carbon steel for weapons and defense supporting industries contrasted with the estimated actual size of their take.

PLANTS PURCHASED

• **United States Radiator Corp.,** Detroit, has acquired the manufacturing facilities of Highway Steel Products Co., Chicago Heights, Ill. The latter company has several contracts for production of airplane landing mats of steel and aluminum for the Air Force. The plant will be operated as the Metal Products Division.

• **Thompson Products Co.,** Cleveland, and **Muskegon Piston Ring C.,** Muskegon, Mich., will merge, it has been announced jointly by both firms. The present management of Muskegon will continue to direct that company's affairs. Muskegon stockholders will receive one share of Thompson common stock for each 2½ shares of Muskegon common.

• **Canadian Allis-Chalmers (1951), Ltd.,** of Lachine, Quebec, has purchased the St. Thomas, Ontario, works of Allis-Chalmers Rumely, Ltd. Both firms are subsidiaries of Allis-Chalmers Mfg. Co., Milwaukee.

Used Machine Tools Available to AF Contractors

DAYTON, Ohio—With the Air Force opening up its machine tool storage warehouses to supply machinery vitally needed for defense production (*AM*, Aug. 6 '51, p 149), Air Force contractors and others have been asking just what machine tools are available.

Here is the situation on machine-tool availability from Air Force storage:

• **Available, or no demand:**

Gear hobbers, grinders, shapers, finishers; spline millers; thread grinders and millers; circular cut-off saws; cylindrical grinders; sperial boring machines; drillpresses, belt driven; electric melting furnaces; roll-over molding machines; direct-current motors.

• **In short supply or out of stock:**

Centerless grinders; milling machines, knee-type; radial drills; lathes, production; boring mills; turret lathes, horizontal and vertical; bandsaws, metal cutting; broaching machines; surface grinders, small and medium sizes; spar millers; jig borers, all types; drill-presses, gear driven; screw machines, popular models.

Machines not listed above must be evaluated on an individual basis. Lapping and honing machines, rivet freezers, presses, heat-treatment furnaces, annealing ovens, and hundreds of other tools have little demand in one size or style, yet other models are very popular.

Air Force reports little demand for its stock of special process machines and machines which have been modified and tooled for a particular operation.

• **Most popular** of the machines in storage are the basic shop machine tools—lathes, millers, radial drills, surface grinders, contour bandsaws, jig borers, etc. This condition is understandable in light of the small-lot orders of parts, and of the large amount of defense contract work presently in tooling and development stages. Relatively few components are required on a continuous high-production basis which would utilize the special machines built for all-out World War II targets.

Lack of demand for gear cutters and finishers is explained by differences of today's defense program compared with World War II. Jet engines, for example, require very few gears, whereas reciprocating engines provided a high gear demand.

On the other hand, high-temperature materials and the new postwar alloys require more powerful machine tools and different machining methods. Techniques that were only experimental five years ago are now available for production.

Broaching has replaced many boring and milling operations, hence the demand for broaching machines is greater than that for special boring machines and heavy production millers.

Important note: machines listed above are at Air Force storage depots. Demand, or lack of it, is primarily a function of AF contract requirements. It is possible that machines no longer necessary for manufacturing Air Force materiel are needed by contractors for the other armed services. Many builders of machinery listed by AF as "available" are quoting distant delivery dates on new machinery.

Plans are now underway which permit other services to screen the AF lists for full military utilization of the tools before they are released as surplus for civilian purchase.

Plant Expansion News

• **Ford Motor Co.** will spend $43 million in an expansion and modernization program of its River Rouge steel plant. The program is expected to add 190,000 tons of finished steel capacity annually for defense and civilian use. Scheduled are 37 new coke ovens, a new sinter plant, installation of new pig casting equipment, and improvements in the open hearth and rolling mill facilities.

• **Chase Brass & Copper Inc.** has allocated $18 million for expansion of production facilities in the Cleveland area. The company will increase its manufacturing capacity 50% by adding another 100,000 sq ft to both the Cleveland Mill Div. and the Euclid Case plant. Plans also include construction of a $½ million warehouse at Euclid Ave. and E. 40th St.

• **Fairfield Mfg. Co.,** has started construction of a $2½ million plant at Lafayette, Ind. The new structure will provide Fairfield with 181,000 sq ft of floor space to house office, engineering, and manufacturing departments for the production of gears and differentials.

• **Mack Trucks, Inc.** is constructing a service parts plants at Bridgewater, N. J. The parts building and offices will occupy approximately 425,000 sq ft. Scheduled completion date is Jan. 1, 1952.

• **Modern Corp.,** Oak Park, Mich., has completed a plant expansion program which doubles floor space for production of special metal cutting tools.

• **Chevrolet Motor Div.,** General Motors Corp., Detroit, will build 1,000,000 sq ft of new buildings in the Buffalo, N. Y., area to provide additional manufacturing capacity needed for the production of Wright R-3350 aviation engines. Three new building projects are planned on the present site of Chevrolet operations in Tonawanda.

• **Hyatt Bearings Div. of General Motors Corp.,** Harrison, N. J., plans expansion of manufacturing areas in Hyatt plants in both Harrison and Clark Township, N. J.

American Tanks Match Anything Reds Have Shown in Korea

WASHINGTON — Despite early Korean war talk of the invincible Russian T-34 tank, Army Ordnance experts didn't change their thinking and try to build a bigger tank. Reason was that as tank men got to know their equipment better under combat conditions, they found that the General Patton medium tank was an easy match for the much lauded Red T-34. And, they had confidence in the new light tank then entering production.

It took only a short time to figure out what was needed to beef-up the Patton. Equipped with an 810-hp engine, plus the 90-mm gun with a high muzzle velocity, it already had the advantage. But it did need more compact ammunition with a more rapid loading system for the gun, plus a greater ammunition capacity. Production changes already have been made to lick these deficiencies.

Ordnance engineer and armament experts are guided by three principles in tank design: firepower, mobility, and armor—in that order. They want a turret that provides a stable gun platform to insure that the first aimed round will hit the target, and secondly that the tank has sufficient cruising range to carry out its mission.

• **The answer** to this kind of thinking was the 26-ton M-41 Bulldog. Ordnance claims that the Bulldog, equipped with the high-velocity 76-mm gun outfights anything the Reds have yet to come up with. In addition, it's powered with a 500-hp engine. With the added horsepower plus being a lighter tank, the M-41 fills the second "must" for tank design—mobility. And, the 76-mm gun —smaller than the conventional 90-mm mounted on the Pershing and Patton models—packs a heavy punch. It's got a high-velocity muzzle that insures penetration of all known armor.

• **Tank action in Korea** further indicated the need for simplicity of tank control. Older-type tanks like the Patton and Pershing used lever control devices like those on tractors which required plenty of "beef" to steer. This also required that the operator be given extensive training. Newer tanks have a single "wobble stick" to do the steering.

Stacked up against Red tanks now used in Korea, the US comes away with a clear advantage. Our tanks hold up well under enemy fire. But Ordnance experts point out that no tank can be made completely foolproof.

• **On the maintenance side,** here's what the Pentagon has to say about US tanks: superior production techniques makes the American tank hard to beat. Weldments and welded joints seldom fail. Frequency of breakdowns is normal. Usually breakdown trouble occurs with moving parts outside the shell, such as gears and treads. Unless damage is serious, tank retrievers coupled with complete mobile machine shops at the divisional level get tanks back into action within a few hours.

THIS IS THE MEETING SEASON

Sept. 26-28—American Society of Mechanical Engineers, fall meeting; Hotel Radisson, Minneapolis.

Sept. 26-28—National Metal Trades Assn., annual convention; Palmer House, Chicago.

Oct. 1-2—American Machine Tool Distributors Assn., annual meeting; Chalfonte-Haddon Hall, Atlantic City, N.J.

Oct. 3-5—Pressed Metal Institute, fall meeting; Drake Hotel, Chicago.

Oct. 8-12—National Hardware Show, Grand Central Palace, New York, N.Y.

Oct. 13-19—American Society for Metals, annual seminar (Oct. 13-14); **National Metal Congress & Exposition** (Oct. 15-19); Hotel Statler, Detroit and Michigan State Fairgrounds.

Oct. 14-19—World Metallurgical Congress; Hotel Statler, Detroit.

Oct. 15-18—Society for Non-Destructive Testing, Inc., annual meeting; Hotel Detroiter, Detroit.

Oct. 22-24—American Standards Assn., annual meeting and National Standardization Conference; Waldorf-Astoria Hotel, New York.

Oct. 22-26—American Institute of Electrical Engineers, fall meeting; Hotel Cleveland, Cleveland.

Oct. 25-26—Gray Iron Founders Society, Inc., fall meeting; Edgewater Beach Hotel, Chicago.

Oct. 28-30—Conveyor Equipment Manufacturers Assn., fall meeting; The Homestead, Hot Springs, Va.

Oct. 29-31—American Gear Manufacturers Assn., semi-annual meeting; Edgewater Beach Hotel, Chicago.

Nov. 1-4—National Tool & Die Manufacturers Assn., annual convention; Hotel Statler, St. Louis.

Nov. 4-7—National Screw Machine Products Assn., fall executive meeting; The Homestead, Hot Springs, Va.

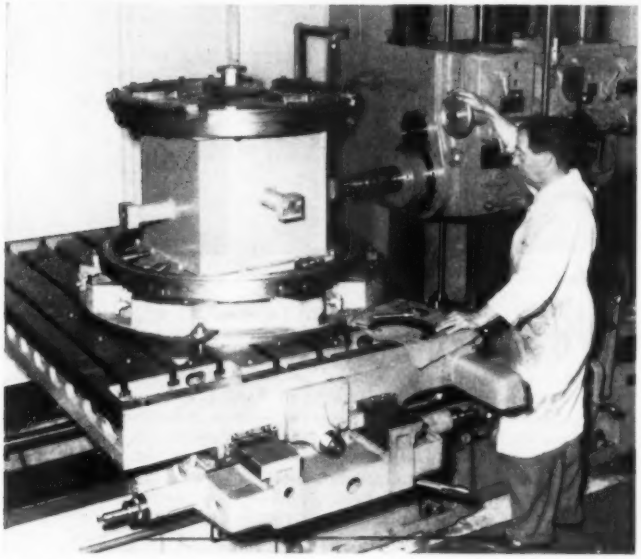
Nov. 7-9—American Society of Body Engineers, annual convention; Rockham Memorial Bldg., Detroit.

Nov. 7-9—National Machine Tool Builders Assn., annual meeting; The Homestead, Hot Springs, Va.

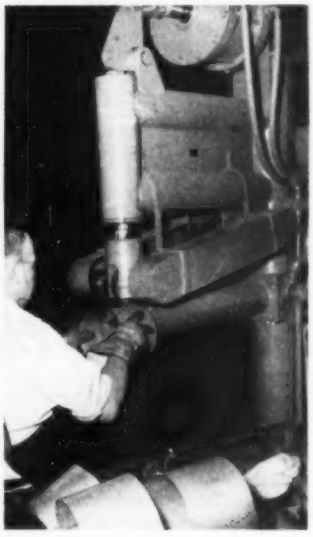
Nov. 12-16—National Electric Manufacturers Assn., fall meeting; Chalfonte-Haddon Hall, Atlantic City, N.J.

Nov. 15-16—Magnesium Assn., fall meeting; Biltmore Hotel, New York.

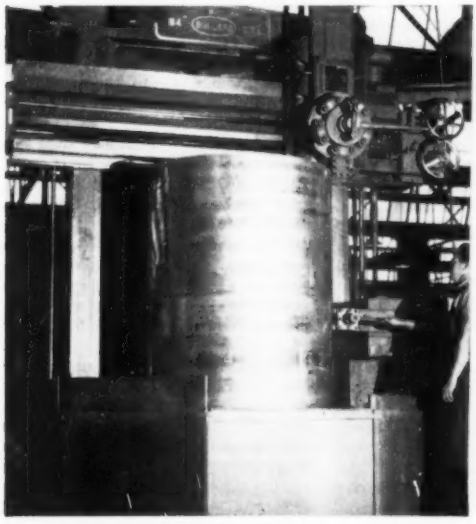
Ryan Speeds Plane Production With New Machine Tools



Ryan Aeronautical Company, San Diego, uses this new Giddings & Lewis horizontal boring, drilling and milling machine to do in eight hours what used to require 40 hr. Formerly, to drill and bore exacting positioning holes in the GE J-47 tool used in making tail cones, drill points had to be located by hand, using temporary drill templates and a calibrated scale. Now the tool is placed in the new machine and holes are located and drilled using the machine's precision scales. Typical production jobs performed on the new machine are the combination boring and milling of large cases and ducts for jet power planes



Seam-rolling machine developed by Ryan steps up job of smoothing weld seams by 1000%. Former practice was to weld stainless-steel exhaust sections with filler rod added. Excess metal at the seam was removed with a hand-held power-driven grinder. Now, welded sections are placed between two steel rollers to flatten the seam. Pressures up to 20,000 lb can be applied



With this Bullard Cut Master "Hi Boy" vertical turret lathe, said to be tallest in the West, Ryan estimates that production is stepped up 25% on items like the 48-in. aluminum rings for external fuel tanks. Similar increased production rates are anticipated on steel cones, aft frames and other jet engine parts. The machine stands 13-ft high

Turchan Hydraulic Duplicator installed on Bullard vertical turret lathe converts the lathe into an automatic production tool with time savings approaching 100%. Here flanges on exhaust cones for GE J-47 jet engines are being machined. The lathe-duplicator combination produces work often so smooth that final grinding can be eliminated

Herman F. Zorn

Bernard E. Aldridge

Paul Janesch

Lt. Gen. K. B. Wolfe

Names in the News

Herman F. Zorn, formerly president and general manager of V & O Press Co., Hudson, N.Y., has been named executive vice president of Ferracute Machine Co., Bridgeton, N.J. He joined V & O in 1923 as an inspector, later became shop superintendent, sales engineer, sales manager, and vice president before his election to the presidency in 1944.

W. F. Rauber, manager of sales of the General Electric Co.'s Switchgear Dept. in Philadelphia, has been named special representative of the GE Large Apparatus Division in Washington, D.C. **Clarence E. Burke,** manager of sales of the GE Specialty Transformer and Ballast Dept., Ft. Wayne, Ind., was named to succeed Mr. Rauber at Philadelphia. **Edmund C. Schorr** was named to succeed Mr. Burke at Ft. Wayne, after serving as assistant manager of sales for the past year. **Dr. Louis T. Rader** was named assistant manager of engineering of GE's Control Divisions at Schenectady. Last year he became division engineer of the Manual and Accessory Control Engineering Div. **Edwin H. Howell** has been named assistant manager, east central district, GE Apparatus Marketing Division, Cleveland. **Vice Admiral Willard A. Kitts, III** (USN, ret.) has been named manager of ordnance engineering for the Aircraft, Federal and Marine Divisions of General Electric Co., Schenectady, N.Y.

T. L. Richards has been named sales manager, Industrial Balancing Div., Bear Mfg. Co., Rock Island, Ill. He was formerly a divisional sales manager for American Machine & Metals Co., East Moline, Ill., and sales manager for Tinius Olsen Co., Philadelphia.

Bernard E. Aldridge has been named sales manager of the new Cutting Tool Div. of the DoAll Co., Des Plaines, Ill. DoAll recently expanded its regular line of band machines and gage blocks to include a complete new line of cutting tools, gage blocks and accessories and industrial supplies. Mr. Aldridge is responsible for coordinating this new expanded line throughout DoAll's own network of sales-service stores. **Paul Janesch** was named assistant sales manager of the new division, responsible for correlation training of cutting tool specialists, promotional aids and inventory controls. He was formerly with Avildsen Tools & Machines, Inc., as district sales manager. **Robert Douglas** was named executive buyer for the expanded line of industrial products.

Roy E. Lambert has been named assistant superintendent of Link-Belt Co.'s Dodge ball and roller bearing plant in Indianapolis. Since 1945 he has been district sales engineer at Chicago.

A. A. Rorison, formerly comptroller, was elected vice president, secretary-treasurer of Vic Pastushin Industries, Inc., Los Angeles. **Charles W. Demarest,** formerly chief tool design engineer, was named superintendent, tool design and tool fabrication. **Joseph H. Moore** was named project superintendent in charge of experimental work.

J. S. Mourer has been named manager of the new Pittsburgh office, Landis Tool Co., Waynesboro, Pa. Mr. Mourer previously worked in the Chicago area. The new office is located at 4140 Brownsville Road, Pittsburgh 27.

Lt. Gen. K. B. Wolfe, recently retired as Air Force deputy chief of air staff, materiel, has been named president of the newly organized Oerlikon Tool & Arms Corp. of America, a subsidiary of Oerlikon Machine Tool Works, Buehrle & Co., Zurich, Switzerland. No announcement has been made as to what facilities the corporation will construct in the US, or where they will be located. General Wolfe's offices are in the Duryea Bldg., Washington. Before becoming deputy chief, in 1949, General Wolfe was director of procurement and industrial planning of Air Materiel Command at Wright Field, Dayton.

Robin S. Kersh has been named manager of Westinghouse Electric Corp.'s Steam Div. at South Philadelphia, Pa. He was manager of central station sales, in which position he has been succeeded by **Carroll V. Roseberry,** former central station supervisor for the Los Angeles territory. **William F. Lutz** has been named staff assistant to the Elevator Division's general manager of manufacturing and engineering, **H. W. Tenney.**

Raymond L. Collier has been appointed executive secretary of the recently organized National Association of Aluminum Distributors.

Peter V. Martin, sales manager of the Metallurgical Dept., Engineering & Construction Div., Koppers Co., Inc., Pittsburgh, has been named an assistant vice president in the Freyn Engineering Dept. of that division.

Martin Kaufman has been named to head a new machinery rebuilding division of Products Engineering Co., East Orange, N.J., which is presently rebuilding machinery for the Air Force reserve pool.

William A. Spence

Donald Goodwill

Harvey J. Corrin

Fred Bohle

William A. Spence has been named general manager of Ohio Hoist & Mfg. Co., Cleveland, one of the Round Associate Chain Companies. He had been with Manning, Maxwell & Moore, Inc., since 1934, except for three years during the war.

L. H. Middleton, vice president in charge of the Engineering Div., Electric Auto-Lite Co., Toledo, Ohio, has been named director of engineering. **C. R. Boothby** has been named chief electrical engineer, **H. D. Wilson** was named chief chemical engineer, and **C. C. Cipriana,** chief mechanical development engineer of the Engineering Div.

Alan W. Brown, executive vice president and a co-founder of Cro-Plate Co., Inc., Hartford, Conn., was elected president to succeed **Theodore L. Brantly, Jr.,** who died Aug. 8. **Robert C. Allen,** previously treasurer, was elected executive vice president and treasurer.

William B. Pierce has been elected a vice president of Allegheny Ludlum Steel Corp., Pittsburgh, also retaining his position of technical director. His headquarters will be established in the company's new research laboratory, Brackenridge, Pa.

Benjamin A. Main, Jr., chief development engineer of Aeroquip Corp., Jackson, Mich., since 1942 has been elected vice president in charge of engineering. **H. L. Schrock, Jr.** was elected vice president and treasurer.

Dr. Mark E. Putnam has been elected to the newly created position of executive vice president, Dow Chemical Co., Midland, Mich. He has been a director since 1941 and a vice president since 1942.

Donald Goodwill has been named chief engineer of Lees-Bradner Co., Cleveland. He joined the firm as a detailer in 1934, and has served as assistant chief engineer since 1940.

Harvey J. Corrin, vice president of Cleveland Punch & Shear Works Co., was feted August 30 as the first worker to spend 50 years with the firm. He joined the company in 1901 at the age of 16, as a junior office boy. He progressed through the cost and sales departments, becoming sales manager in 1918. He was elected vice president in 1941.

C. R. Irvine has been named assistant division manager and chief engineer, Convair Guided Missile Div., Consolidated Vultee Aircraft Corp., San Diego, Calif.

J. P. Orchard, executive vice president, has been elected president of the Fort Wayne Div. of Bowser Inc., succeeding **E. C. Marsh,** resigned. Mr. Marsh had been with Bowser since 1909, and will continue to serve as a director. Mr. Orchard joined Bowser in 1940 as controller. Previously, he was engaged as a management consultant.

H. Stanley Bimpson has been named to the office of the director of engineering of Allis-Chalmers General Machinery Div. as consulting engineer. Since 1947 he has been chief engineer of the company's Blower & Condenser Dept. After 50 years of service, **L. A. Watts** is retiring as manager of the service and erection section of the division. He will remain with the company on special assignments until early in 1952. **C. B. Smith,** supt. of service and erection of the Atlanta district since 1941, succeeds Mr. Watts. **C. P. Suykerbuyk** of the Los Angeles office succeeds Mr. Smith at Atlanta.

Fred Bohle has been named manager of the recently organized Machine Tool Development Dept. of Illinois Tool Works, Chicago, with authority over all phases of development, design, production and sales of Illinois Tool Works machines. Formerly chief engineer of the company's tool division, Mr. Bohle has been with firm since 1935.

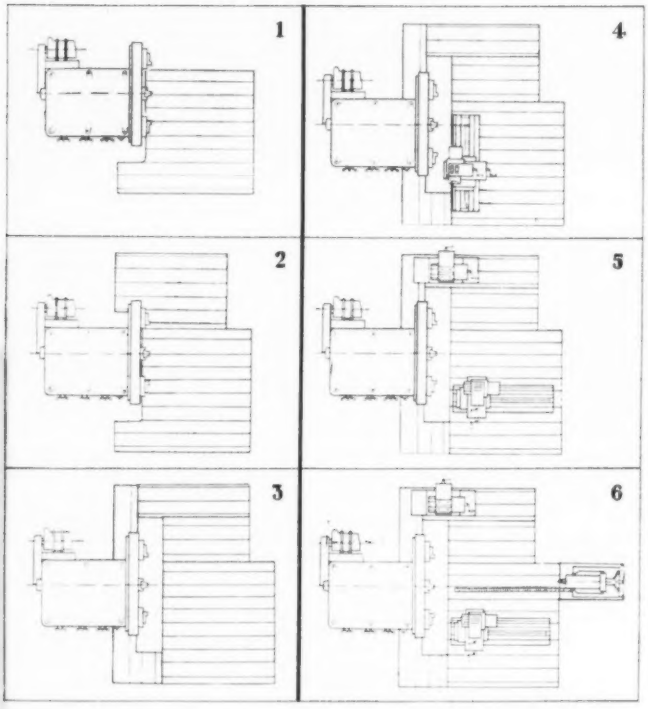
Dr. Raymond C. Machler has been named director of research and member of the executive committee, Leeds & Northrup Co., Philadelphia. Dr. Machler, formerly associate director, succeeds **I. Melville Stein,** recently elected to the newly created post of executive vice president. **J. C. Peters,** associate director of research, is joined in that capacity by **G. A. Perley** and **A. J. Williams, Jr.**

A. C. Bishop has been elected board chairman and **G. A. Peterson** was elected president of Ferro Engineering Co., Cleveland. **Walter M. Charman, Jr.,** son of the company founder, was elected executive vice president. **P. R. Ward** was named vice president.

Walter E. Palmer has been named regional manager for All-State Welding Alloys Co., Inc., White Plains, N.Y., to cover New Jersey, eastern Pennsylvania, Maryland, Delaware and the District of Columbia.

Benjamin Cravens has joined Sterling Engineering & Mfg. Co., Wilkes-Barre, Pa., as chief engineer and assistant general manager. Since 1947 he has been assistant to the president of H & B American Machine Co., Pawtucket, R.I. Since Feb., 1950 he had been in charge of the New England territory for Barrington Associates, management consultants, in New York.

New Shop Equipment



By using standardized sections and units, a wide variety of models to suit the job can be obtained. Fig. 1, 2, and 3 show the various base plates that can be attached. Fig. 4 shows a side bed in a transverse position for facing cuts. Fig. 5 shows the side bed in a longitudinal position and a secondary bed with saddle and toolpost for end turning. In Fig. 6 is the complete machine with tailstock. Note the pit in the last four figures for turning extra-large work. A synchro-electric drive allows the bed-saddle-and-toolpost units to be arranged in any possible position in respect to the main spindle. The hexagonal tool turret is mounted on a round plate for indexing. The turret, tools, and plate can be removed as a complete unit for speedy retooling

German Sectionalized T-Lathes to Turn or Face

These lathes are especially designed for the machining of thin-walled bulky work. They are made up of independent standardized sections which may be assembled to suit individual requirements. Two basic units can thus be obtained: the conventional bed lathe, and the sectional baseplate unit.

The sectional lathes come in 4 models, with the height of centers ranging between 37 and 47 in. and a maximum work dia of 235 in. Eighteen spindle speeds are provided in the two larger models, with ranges of 0.96—48 rpm and 0.75—38 rpm (largest). The smaller models have infinitely variable spindle speeds, 3.5—175 and 2.5—130 rpm. Nine different feed rates for facing and longitudinal turning are provided.

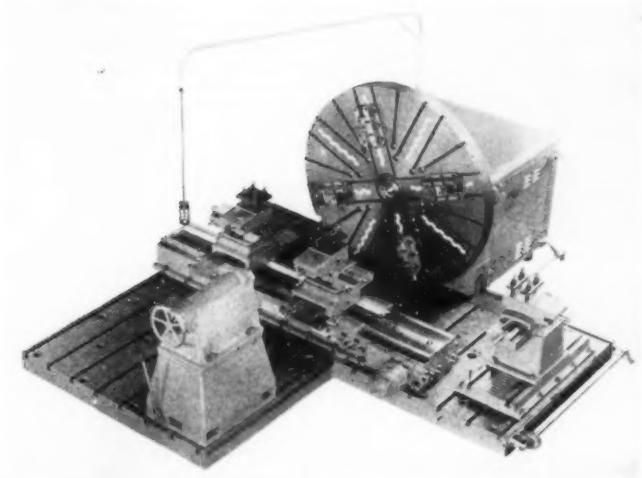
The lower spindle speeds are transmitted direct to the rim-gear face plate, while the higher speeds are transmitted to the main spindle. All working parts of the main-drive mechanism are lubricated by an oil pump. In bed lathes up to 33-ft turning length and in sectional machines to 120-in. work dia, the feed motion is still transmitted by mechanical means, change gears being used where a screw-cutting attachment is provided. These mechanical means include a quick-change gearbox and either a leadscrew and feed rod or geared shaft trains.

The "Electric Shaft"

Feed motion is provided on the larger machines by a synchronized drive system which may also be termed an "electric shaft." A pilot motor located on the headstock is electrically connected to a servo motor mounted on the saddle, the two motors operating in synchronism with the face-plate speed. This arrangement eliminates the use of eccentrics, linkages, ratchet-and-pawl mechanisms, and long transmission shafts, which, especially in the case of small feed rates, give rise to chatter and non-uniform operation.

The moveable bed on the section lathes can be arranged on the base plate in any desired longitudinal or transverse position. The only connection between the feed motor and the headstock pilot motor is the electric cable. The feed rate, controlled by the pilot motor, is transmitted by the feed motor to a feedbox located at the end of the transverse bed. This feedbox, in turn,

Materials and Parts



These lathes are of equal usefulness for facing, (with or without pit) or for turning work between centers. Their infinitely variable spindle speed is of particular advantage when facing

operates the saddle tool feedscrew.

In the latest models, the cross-section of the transverse bed is stepped-down to the rear. The front-bed beam is higher than the rear beam, the former being provided with a narrow guide way. The feed motion is derived from a worm rack located at the point of maximum stress, ensuring smooth and uniform feed motion. The stepped-down bed provides an unobstructed view for the operator from right of saddle.

Headstock

The main drive is from a standard electric motor which is easily accessible in a properly ventilated compartment in the headstock. V-belts transmit the motor power to a sliding-gear mechanism for the different spindle speeds. The V-belts are tensioned by tilting the motor bracket. The massive main spindle is supported by split journal bearings. End thrust is absorbed by ball thrust bearings. The spindle nose has an M-100 (metric) taper and is threaded for a clamping bolt. Hollow main spindles are also available.

Face Plate

The face plate is of heavy cross-section reinforced by large ribs. The clamping jaws are guided in cast-steel boxes which can be easily shifted on the face plate, the jaws themselves being adjusted by screw spindles. Eight clamping jaws can be used simultaneously.

Tailstock

The tailstock has been designed to support extra-heavy work. Its upper section can be offset transversely for accurate alignment and for taper turning. A spindle sleeve with a built-in live center is also available. The tailstock guide ways extend over the entire length of the base plate. A rack with diagonal teeth, in combination with a worm gear and a ratchet-and-pawl mechanism, is used for longitudinal setting.

Contour Equipment

Hydraulic contour equipment is available for any model. The upper toolholder follows the movements of the tracer on the templet. When rotating this toolholder by 30° on the post, it is possible to cut cones and curves and to also cut at 90° to the main spindle axis, while the longitudinal feed remains in operation.

The high-pressure oil pump, tank, valves, and oil filter are separate

. . . INCLUDING

Horizontal boring and facing machine delivers 50 hp to each head and uses carbide tools page 184

Engine lathe (Italian) has eight spindle speeds in a range of from 52 to 2000 rpm . . page 185

Thread-milling attachment for use with multiple-form cutters is integrally powered page 190

Vertical milling head has a micrometer, vertical-quill spindle feed . . . . . page 186

Circle shear and flanger can change setup from one job to another in short time page 186

Automatic battery charger for industrial trucks weighs only 190 lb—is shelf mounted . page 188

Machinist's vise employs a self-lubricating thrust bearing at the front of the sliding jaw to prevent wear . . . . . page 194

Strip-steel machine pin is formed by spiral winding to give variable properties . . . . page 198

German lathe cuts different threads without changing gears by means of a clutch . page 200

. . . and in Oct. 1

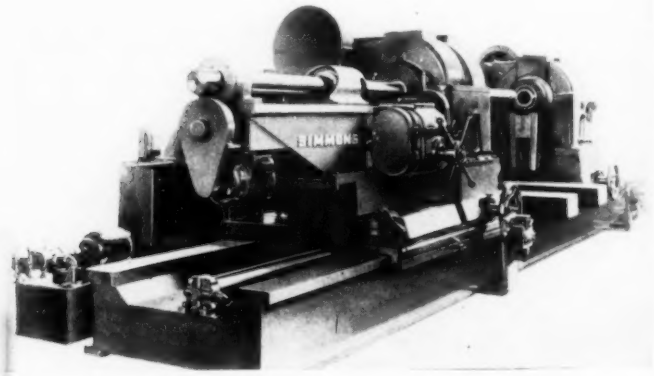
Detroit Metal Show new equipment will be described in our special *Show-in-Print* section—including an electron drill for the high-speed removal of broken taps

Drill grinder in our regular section handles twist drills from No. 70 to ¼ in. Its quick-locking chuck has an infeed for finish cuts

and independent of the machine. Connection to the toolpost is by tubing.

The tool-feed cylinder is incorporated into the toolholder. The templet is supported independently and parallel to the bed and may be adjusted accurately. The tool has a transverse movement to make adjustment possible independent of the hydraulic system. Tracer control range is 12 in.

Kurt Orban Co., Inc., 21 West St., New York 6, N. Y.



Horizontal Boring, Facing Machine Delivers 50 hp to Each Head

	Model A	Model B
BORING BAR—		
dia.	6 in.	6 in.
length	17 ft	17 ft
travel	60 in.	60 in.
BORING HEADS—		
bar speeds	11—140	3.3—40 rpm
travel	54 in.	76 in.
FACING ARMS—		
capacity, dia.	54 in.	68 in.
BORING-BAR CENTER—		
above bed	34 in.	44 in.
above table	28 in.	36 in.

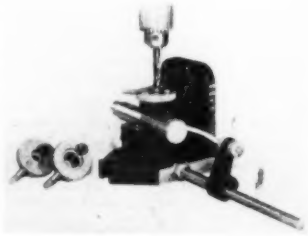
To take advantage of carbide tooling, this 6-in.-bar boring and facing machine provides high cutting speeds with large stock removal.

The entire boring and facing unit moves hydraulically along the bed, with screw feed to the boring bar in the heads. The machine can deliver up to 50 hp to each head at boring speeds approaching 150 rpm. Anti-friction bearings and alloy-steel, heat-treated gearing are used throughout.

A new development is the continuous-feed facing head. Power take-off for the feed gearing dispenses with the usual star feed and allows high-speed facing with carbide tools.

The basic unit can be adopted to a large variety of work. For example, a machine built for a manufacturer of diesel engines and pumps is used primarily for bearing and facing large cylinder liners, and other related work. It consists of a boring and facing unit with bar feed, a facing tailstock, and power-operated cross-table. Bed lengths, widths, and bar heights can be supplied to suit.

Simmons Machine Tool Corp., Albany 1, N. Y.



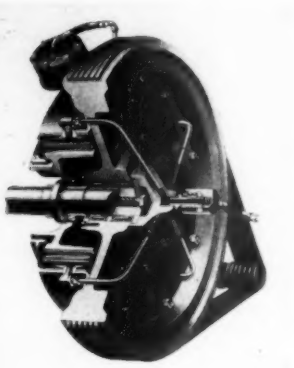
Mathewson Drill Jig

The pilot model of this drill jig was described in *AM*, Feb. 19, 1951—p 200. This is a completely redesigned and improved model.

Changes and improvements include a more positive and more easily adjustable combination stop which can be used on either right or left side. In the pilot model, cap screws were fed into the front of the jig to a stop projecting through the slot in the back, and the V-block had to be turned over when changing for drilling stock a longer distance from the end. With this model, the stop makes it possible to feed all work in the same direction and quickly make changes from drilling cap screws to drilling round or hex stock at any distance from the end. It is only necessary to change the V-block when changing to the alternate-dia range.

The V-block is flame-hardened cast iron and the casting design includes a ring on the block so it may be easily picked up and turned. The block design now has rounded edges, and all highly polished surfaces have been eliminated by using a satin finish.

Mathewson Machine Works, Inc., 25 Huntington Ave., Boston 16, Mass.



Air Friction Clutch For Press-Rite Power Presses

Interlocking clutch-brake action, long maintenance-free life, and increased operator safety are advantages claimed for the air friction clutch and spring- and air-applied brake combination.

The clutch and brake are both of the constricting-drum type. They therefore utilize centrifugal force for instant disengagement of friction surfaces. The brake is applied by a constant-pressure spring opened and released by air and its actuation opens a valve to release air from the clutch. Interlocking of clutch and brake prevents either from engagement when the other is operating. If air or electric power fails, the clutch disengages and the spring brake stops the press instantly.

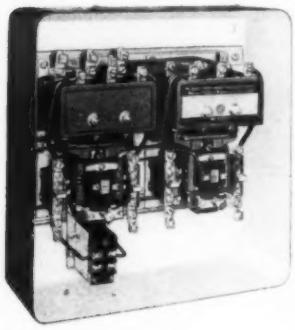
Interlocking brake and clutch action and seal-packed flywheel bearings reduce wear to a minimum.

Clutch and brake-shoe linings are self-compensating for wear.

Variable clutch-gripping pressure permits the operator to set clutch grip for every job. Optimum efficiency of clutch is at pressures from 40 to 80 lb and it will operate satisfactorily at as low as 25 lb. The 360° contact of friction surfaces provides full operating power for a given clutch-gripping pressure.

The mechanism is available as optional equipment with the No. 3—30-ton and the No. 85—85-ton presses in the Press-Rite line.

Sales Service Machine Tool Co., 2363 University Ave., St. Paul, Minn.



Part-Winding Starter From Allen-Bradley

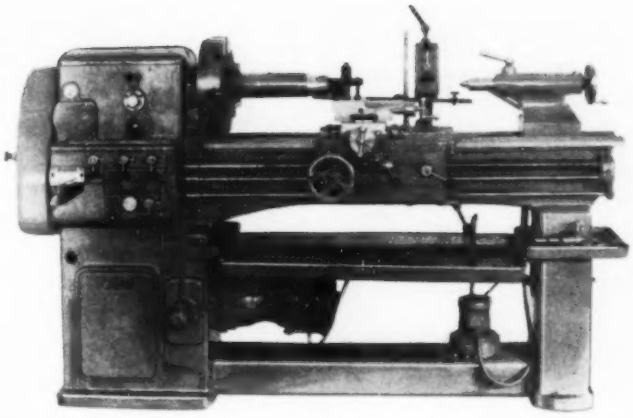
An ac part-winding starter has been designed for use with motors employing two separate parallel windings, star or delta, to obtain increment starting.

The starter consists of two across-the-line starters and a pneumatic timing mechanism mounted below one starter and operated by the starter's solenoid plunger.

Pressing the start button immediately closes the first starter which energizes one of the two parallel windings. Meanwhile, the timer is in operation and energizes the second starter. With both starters closed, full line current is supplied to the motor through both windings, each using 50% of the total current drawn.

Use of part-winding starting does not produce objectionable current surges obtained with auto transformer starting as the motor is not disconnected from the line during the starting period. Whenever reduced-voltage starting is necessary this starter and a part-winding motor can be used. Applications include air-conditioning and refrigeration systems.

Allen-Bradley Co., Milwaukee, Wis.



Italian High-Speed Engine Lathe Uses Quick-Change Gears

A geared-head engine lathe with a 13-in. swing, recently developed in Italy, is now being imported into this country.

The rugged precision lathe is available in a high-speed model with a range of 52 to 2000 rpm, as well as the standard model in a 26- to 1000-rpm range. Both machines have eight speeds and are powered by a 3-hp motor.

A feature of the 13-in. lathe is its range of 5 longitudinal and 5 cross feeds without change of gear, accomplished by means of a dial in the Norton box. Longitudinal feeds range from 0.002 to 0.040 in., cross feeds from 0.001 to 0.020 in. The leadscrew and feed bar operate independently. Five ranges of threads can be cut by the use of the quick-change gears, and an extra gear is supplied to cut extremely fine gears.

A removable gap provides maximum swing of 20¾ in. for a distance of 4½ in. in front of the faceplate.

Tools and accessory equipment are lodged in a locker built into the base of the machine. A four-jaw chuck, a built-in coolant system with electric pump, a steadyrest, and toolpost are standard accessories.

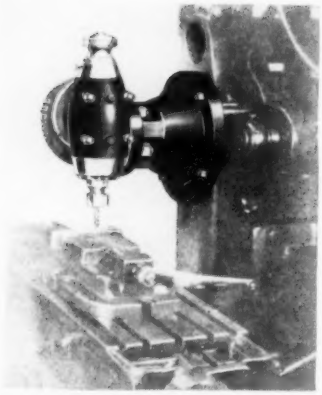
Kelvin Systems Corp., 53 Water St., S. Norwalk, Conn.

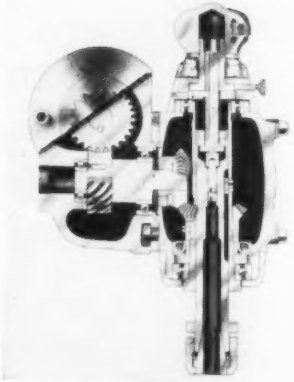
Screwdriver Holds Bits and Drills

Spiral screwdriver features a handle of clear-transparent Tenite plastic holding alternate bits and drill points. For driving screws or boring small holes the workman chooses the proper point at a glance, inserts it for operation with one quick pull on knurled sleeve. Chuck holds bit or drill firmly in place until another pull on the sleeve releases it. A button in collar at center of tool controls locking or free movement of spiral shaft.

The handle, shaped for comfortable grip, is not affected by perspiration, or oil and greases. It may be easily wiped clean with a cloth. The screwdriver is known as the Yankee-Handyman.

North Bros. Mfg. Co., Div. Stanley Tools, Lehigh Ave. and American St., Philadelphia 33, Pa.





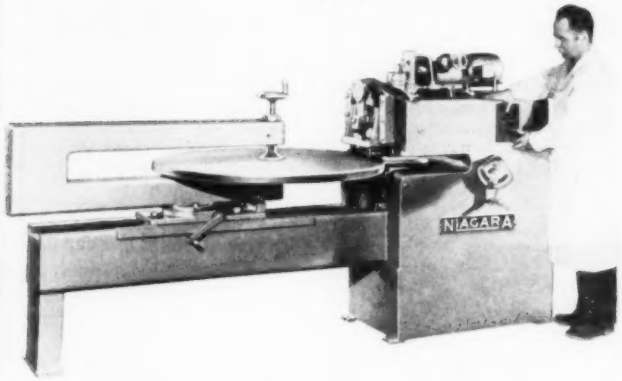
Brown Vertical Milling Head

Micrometer head is for angle boring and milling on horizontal milling machines. It has a micrometer, vertical-quill spindle feed calibrated in 0.001-in. increments. The travel of the spindle is 1¾ to 3 in.

The ground-thread micrometer leadscrew has a navy-bronze stud for spindle-end thrust support with set-screw take-up adjustment. Adjustments are made with an Allen wrench. Spindles are hardened and ground with a two-piece collet tightening nut.

Gear rating is 1½ to 15 hp, running in oil. There are 25 models available for every make and size horizontal milling machine. Any model can be supplied with or without micrometer for the head.

Brown Mill Tool Co., 5443 San Fernando Rd West, Los Angeles 39, Calif.



Niagara Circle Shear and Flanger

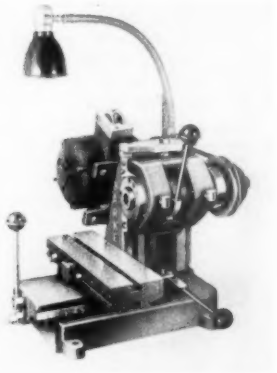
This high-speed machine is especially designed for the production of disks and heads at a minimum tool investment. Setup can be changed from one size job to another in just a few minutes and conversion from circle cutting to flanging or vice versa takes only 20 or 30 min.

The machine can operate on a wide range of thicknesses and diameters. No blanking, forming, or drawing dies for the different-size heads are required.

Circular disks or circular arcs of sheet metal up to 8-gage mild steel or 12-gage stainless can be cut. Disks 8 in. to 58 in. in dia are produced from square blanks. Disks as large as 75½ in. in dia can be cut from octagonal blanks.

Flanges up to 1½ in. deep can be turned from circular disks. The upper roll is moved down by power with speed adjustable to dia and thickness of blank. Standard flanging rolls form a radius at the root of the flange of ⅜ in., which is appropriate for materials within the capacity of the machine. Head diameters ranging from 18½ to 73½ in. can be flanged.

Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo 11, N. Y.



Barker Bench Miller

Spindle speeds	875, 1750, 3500 rpm
Head travel	3 in.
Longitudinal table travel	5 in.
Transverse saddle travel	2½ in.
Motor	¼ hp, 1750 rpm

This small milling machine has longitudinal table travel, transverse saddle travel, and vertical head travel by hand lever on the production model and by micrometer feedscrew on the toolroom model. Any one or more of the three travels can be furnished with feedscrews.

The head has wide dovetail slides and an adjustable gib that prevents deflection and chatter when milling heavy cuts.

The cutter end of the spindle rotates in a preloaded double-row ball bearing. The pulley end rotates in a parallel roller bearing. The standard spindle is hollow and machined to take standard collets from 1/16 to ½ in. dia. Clearance hole in the collet draw tube will take ½-in.-dia stock.

The Barker Engineering Co., 500 Green Rd., Cleveland 21, Ohio

Open-end ratchet wrench is said to be a truly universal wrench. It has 64 socket sizes and can be used with a torque handle for torque-rated fittings. The sockets vary from ⅜ to 4 in. in size. The socket and ratchet ring revolve around when tightening the work.

Tubing Appliance Co., Los Angeles, Calif.

Continuous production

with a CHIP-TOTE

Machine tool production increased through constant removal of chips, turnings and borings.
Eliminates shut-down and reduces waste handling.

The CHIP-TOTE conveyor continuously removes wet or dry chips, turnings and borings from multiple-spindle or automatic machines. Speed of operation can be synchronized with the metal-removing capacity of any standard or special machine.

The scrap material is channeled onto the May-Fran hinged-steel conveyor belt, carried horizontally until clear of the machine's working mechanism, and then transported up a steep incline for discharge into tote box or onto a carry-off conveyor system.

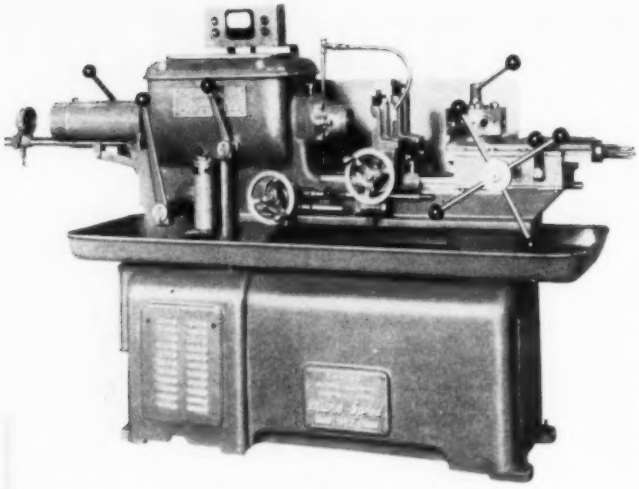
A CHIP-TOTE conveyor eliminates shut-down of vital equipment, stops waste of skilled workers' time, and provides for continuous production. Let a May-Fran CHIP-TOTE solve your production problems . . . automatically and efficiently.

WRITE TODAY FOR THE NEW CHIP-TOTE CATALOG.

168-MF

MAY-FRAN ENGINEERING, Inc.

1677 CLARKSTONE ROAD, CLEVELAND 12, OHIO



Simmons Lathe Uses Spindle Tachometer For Speed Control

Swing over bed	14 in.
Swing over cross slide	6 in.
Width of bed	7 in.
Length of ways	31 in.
Spindle speed	375 to 1500 rpm
Motor	3 hp
Weight	2800 lb

An improved, high-precision No. 2 turret lathe, with 1¼-in. bar capacity, designed for bar and chucking operations in production work, is available from Simmons Machine Tool Corp.

Speed change, formerly selected by handwheel, is now done by push-button control. The operator reads the tachometer indicating spindle speed and can change speed instantaneously. The electric control permits an infinite range of reversible speeds; it also protects against overload.

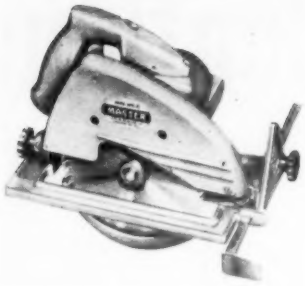
Micro-speed drive permits an infinite range of speed changes while the spindle is in operation in either direction. The drive consists of a unitized ac motor and variable-speed drive mounted on a hinged bracket in the one-piece cabinet base.

The spindle is mounted so that opposed anti-friction bearings on the head end control longitudinal adjustment. A straight roller bearing on the rear end allows for expansion without disturbing adjustment. Drive is obtained through standard, separable-link V-belting.

The multiple-disk spindle clutch is adjustable for wear. An oversized brake operated by the clutch lever brings the spindle to rest almost instantaneously and locks it idle for changing work.

Power feed to the turret ram uses a three-speed gear box and a worm and worm wheel mounted on the turret saddle. A motor-driven coolant pump, with piping, is standard equipment.

Simmons Machine Tool Corp., Albany 1, N. Y.



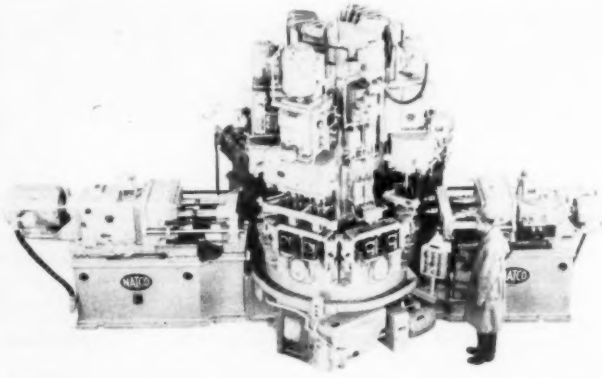
Portable 6¼-in. Saw Has Built-in Bevel

An electric portable circular saw is said to have features found only in higher-priced saws. The Ramsaw is equipped with a 6¼-in. blade which allows for cutting 2-in. stock at a 45° angle.

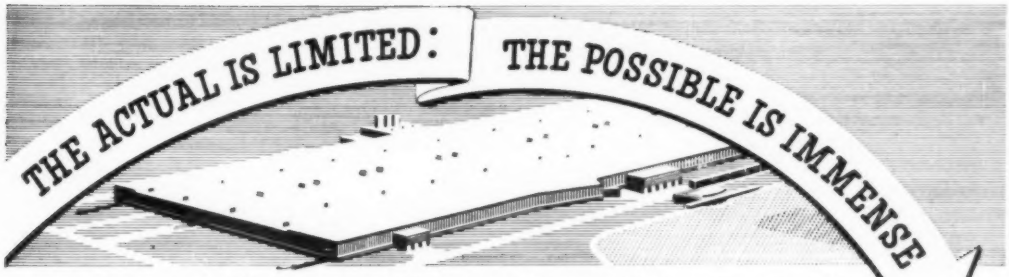
The ¾-hp motor is housed in a light-weight aluminum housing, placed at the left of the blade for balance and ease of cutting. A built-in bevel and depth adjustment are integral parts of the saw. A plastic window in the guard permits visual reference to the line of cut. An adjustable rip fence extends to 8 in. for ripping.

Safety features include a trigger switch and blade cover. The saw uses a self-lubricating, alloy-steel motor shaft and drive gears.

Master-Taper Co., 4531 N. Beacon St., Chicago 40, Ill.



SIX-POSITION AUTOMATIC DRILLER performs 18 operations on 180 cylinder blocks per hr. They include drilling holes from 0.9375 to 0.0625 in. dia, rough boring, facing, chamfering, milling, and rough and finish reaming. The machine has a 65-in.-dia automatic-index rotating table. Seven fixed-center gear-driven heads contain a total of 52 standard drilling spindles mounted in anti-friction bearings and provided with nose adjustment wherever centers will permit. The milling head has two spindles.—*National Automatic Tool Co., Richmond, Ind.*



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1951

HOW ECONOMIES OF WELDED STEEL CUT YOUR PRODUCTION COSTS

WHEN designs utilize the economies of welded steel construction, invariably costs are less. That's because fewer pounds of less costly material are needed . . . Each pound of metal can be more easily concentrated where it does the most good.

Wherever costs are higher, inevitably the designs have fallen short of embodying the potential savings, or the products themselves have been overdesigned. A careful reappraisal by the shop before a design is "frozen" simplifies construction details and eliminates every unnecessary expense for lowest cost of manufacture.

Your Lincoln Welding Engineer will gladly help you analyze your designs and point out various cost reduction possibilities. Simply call or write.

Fig. 3. Saves 51% Cost *by forming lever arm and pad as integral piece from 10 gauge metal. Weighs 2.5 pounds . . . costs 54¢.*

Fig. 4. Saves 67%. Eliminates Broaching. *Hub with integral key is produced by stacking stampings in assembly. Arm is 10 gauge, brake formed and welded to hub. Cost is only 31¢ . . . weight 2.2 pounds.*

the ACTUAL

Fig. 1. Traditional Construction. *Machine foot-lever, 10 inches long, weighs 6 pounds. Cost with broached keyway is $1.15.*

increasing the YIELD

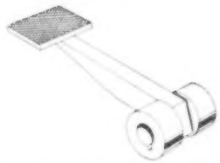


Fig. 2. Simple Steel Design Costs 34% Less. *Can be built by the shop with only saw and shears. Weighs 2.7 pounds . . . costs 68¢ complete with keyway.*

the IMMENSITY of the POSSIBLE

Unlimited opportunities to create efficient, lower cost designs.

SEE HOW STEEL BUILDS IT WITH LESS MATERIAL

Machine Design Sheets are available to designers and engineers. Simply write on your letterhead to Dept. 108,

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 1, OHIO

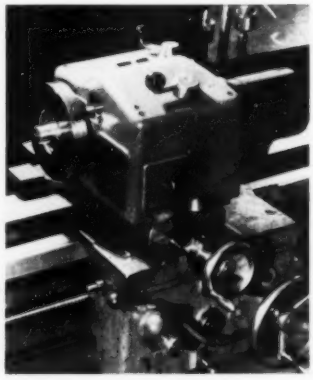
Line of Hydraulic Power Units Made in Three Basic Series

The line contains 224 models of compact hydraulic power units which combine reservoir, pump, and motor. They are manufactured in three basic standard series: (1) Low-pressure units supply up to 1750 psi and range from 1½ to 50 gpm in single-pump models or to 100 gpm in double pump. (2) Hi-low units provide a double pressure source by combining a high-pressure pump and a low-pressure pump having automatic unloading. (3) Hi-pressure units supply up to 10,000 psi and range from 1½ to 5 gpm in single pump and to 10 gpm in double pump.

The low- and high-low units are produced in a variety of tank sizes for given power requirements and for adequate cooling of oil under normal usage. They feature cylindrical bottoms on the reservoirs for maximum lubrication, visible oil-level indicators, adjustable pressure-relief valves, piston or dial gages, cleanout plates, drain ports, and baffles for anti-foaming and oil cooling.

Standard motors are 220-v, 60-cycle, 3-phase, and from 1½ to 15 hp. The power units are available as stationary or portable equipment.

Haskel Engineering & Supply Co., 721 W. Broadway, Glendale 4, Calif.



Thread-Milling Attachment Is Integrally Powered

Designed primarily as a workholding and leading device for multiple-form-cutter thread milling on lathes, milling machines, and some plain grinders, the attachment is said to make threads of greater accuracy and better finish at higher speeds.

For milling, the attachment is mounted on the lathe cross-slide or the milling-machine table. A suitable multi-form thread-milling cutter is mounted in the lathe or milling machine spindle by means of a collet or taper seat. Short workpieces, to 6-in. dia, can be used in the three-jaw chuck provided with the attachment. Pieces up to 7-in. dia or of irregular contour use a faceplate which is supplied. Long work, up to 2½-in. dia, passes through the attachment spindle. Collets, split bushings, and a long-work support are available for work diameters from 1/32 to 2½ in.

Thread lengths up to the work diameter, or a maximum of 2 in., can be cut on material to a hardness of R$_c$40 in 1-1/16 revolutions of the workpiece. Soft materials can be threaded in lengths to 1½ times the work diameter, or 3 in. max. Pitch range is from 6 to 40 tpi. Multiple threads can be produced provided lead is no coarser than 6 tpi.

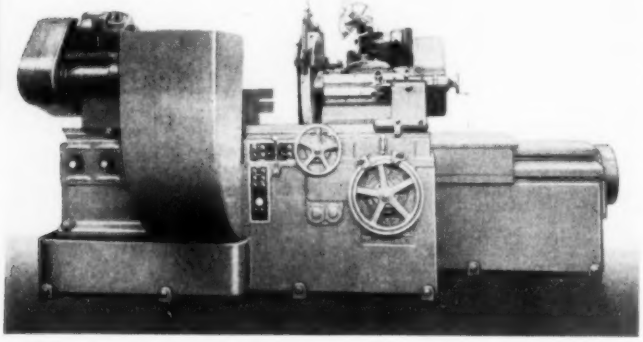
The attachment is integrally powered by a 1/30-hp. 2-speed (750 and 1500 rpm) motor operating at a reduction of 1081 to 1, using 3-phase voltage.

Motor is reversible for cutting left- and right-hand, or internal and external threads. Limit switches prevent overtravel of the spindle and a scale shows spindle position at all times, both for setup and operation. Six spindle speeds are available by various combinations of motor speed and internal gearing, shifted by a lever.

Master screw sets are available for all the standard leads, the set can be used for all forms and diameters if the lead is the same. Except for full square and buttress threads, any form can be cut.

The device, attached to a lathe or milling machine, will convert them to an accurate, high-production, thread-milling machine. The attachment is easily removed when the threading is completed.

Swisma Division, Gubelin International Corp., 35 W. 53rd St., New York 19, N. Y.



NORTON AIRCRAFT-STRUT GRINDERS, built for grinding landing-gear mechanisms, is arranged for a 26- or 32-in.-dia swing over the table, and is available in work length capacities of 72 and 96 in. With an adjustable gap and headstock pedestal, the grinder has an 80- or 86-in swing capacity. The gap can be set in any width up to 26½-in. Wheel-head travel is controlled by adjustable dogs on a large wheel. A swivel table permits grinding of tapers—*Norton Co., Worcester 6, Mass.*

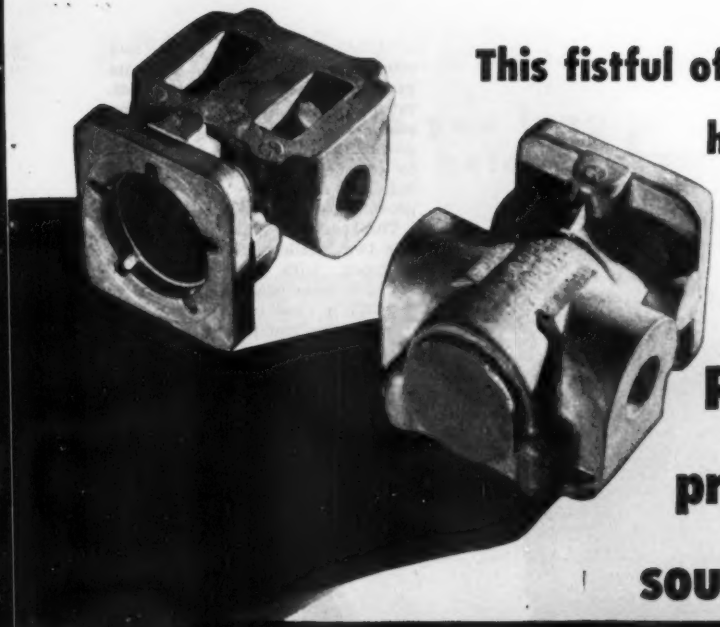
Deep-Hole Drilling Oil

Among the advantages claimed for this oil, when used with a high-pressure pump, are superior chip-flushing action, uniform chip formation, effective cooling of tool and work, faster metal removal, less shut-down time, and longer tool life.

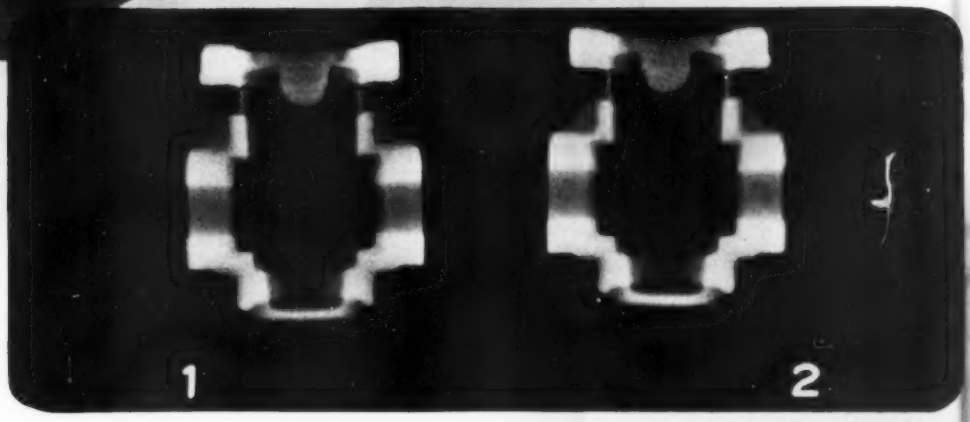
Price, exclusive of federal taxes, ranges from $0.93 to $0.66 per gal. depending upon quantity.

Conner Tool & Cutter Co., 1000 E. McNichols Rd., Detroit 3, Mich.

This fistful of pump has a plane-size job...



Radiography proves it sound



PERFORMANCE requirements for airplane parts run high. They must be strong and rugged. Even with light alloys, demand is for less weight.

Here is where radiography plays an important part. For the designer, knowing all castings used will prove sound, can plan to use the minimum of metal and still maintain needed safety margins.

Foundries making large or small castings—of light alloys or heavy metals—find it valuable to radiograph their castings. Then they know only highest quality work is released. Through pilot castings prior to large production runs, radiography frequently indicates ways in which methods can be improved to save time and increase yield.

Your x-ray dealer will gladly discuss how radiography can improve your plant operations. And if you wish, we will send you a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...

another important function of photography

Kodak
TRADE-MARK

Automatic Wheel Dressing Used On Landis Valve-Face Grinder

The machine is a high-production unit designed for automatically grinding the faces of internal-combustion-engine valves.

The automatic loader receives valves from a conveyor, uses an inclined rack and inserts them, one at a time, in the headstock. During the grinding operation, hydraulic clamping is used in the headstock to position and hold the valve.

The grinding-wheel base and loader are synchronized in a timed cycle. After the valve is loaded in the headstock, the wheel base advances rapidly to grinding position, proceeds with slow, continuous-grinding feed to a predetermined size, sparks out and retracts to the back position. After grinding, valves are automatically ejected.

An automatic wheel-dressing mechanism operates after a certain number of valves have been ground. A compensating feed advances the wheel to take care of the reduction in wheel size. During the dressing cycle, the reciprocating wheel mechanism disengages automatically.

The grinding wheel is 24 in. dia and is driven by a 7½-hp motor. Microsphere bearings are used for both the headstock and wheel spindle.

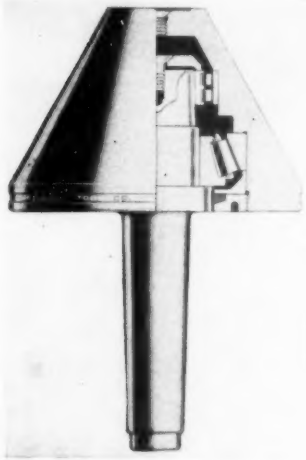
Landis Tool Co., Waynesboro, Pa.

Gage Measures ID With Rotating Connector

The Forotast gage is an instrument for testing inside diameters, with a transmission accuracy of 0.0000591. The transmission element consists of a rotating connector with two rounded slots, set 90° apart on its periphery. The feeler-rod dial indicator fit tightly into these slots. The positioning of the slots makes it possible to withdraw the feeler rod by pressure on the push rod of the indicator dial. Three-point position provides exact centering.

The gage is available in six sizes. The two smallest models are each equipped with eight measuring heads, to cover size ranges of 0.236 to 0.373 in. and 0.993 to 0.669 in. respectively. The four larger sizes are equipped with adjustable gaging rods with hardened contact surfaces, ranges of 0.708-1.181, 1.181-2.362, 1.968-3.937, and 3.937-6.299 in. All models available with either 0.001 or 0.0001 in. indicator dials.

Karl A. Neise, 381 Fourth Ave., New York 16, N. Y.



Bull-Nose Center For Heavy-Duty Use

Designed for heavy-duty work, a shank bull-nose center is said to take loads up to 10 ton and head sizes up to 24 in. Two single-row anti-friction bearings are shrunk on, spaced apart and preloaded for maximum radial and thrust capacities.

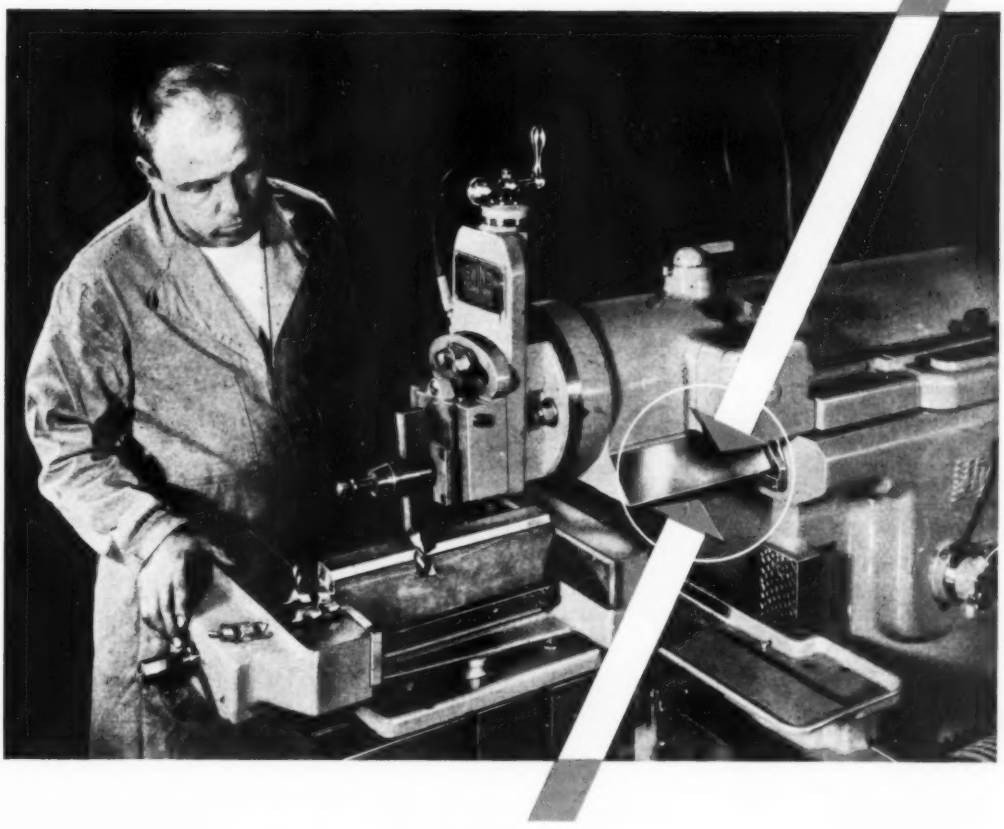
The head is of hardened tool steel and the shank is heat-treated alloy steel. Lubrication is sealed-in. The deflection ratio control accuracy is guaranteed as is the entire center.

Because it is used as original and replacement equipment the center is available for Morse, Jarno, Brown & Sharpe, Hendy, or special tapers and straight shanks.

Ready Tool Co., 55½ Iranistan Ave., Bridgeport, Conn.

ROCKFORD HYDRAULIC SHAPERS

give you long life, hold original accuracy here



...because ram ways are flame hardened and ground

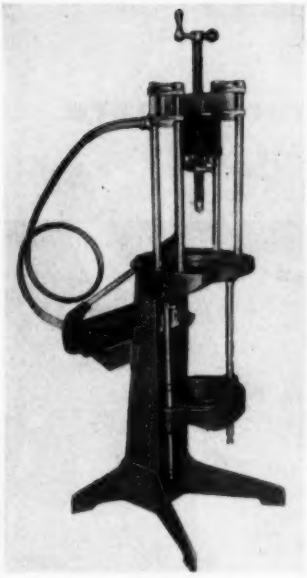
Rockford Shapers have flame-hardened and ground ram ways to help prevent scoring under heavy cuts and high cutting speeds. Ram bearing gib adjustments are also easier to make, without the danger of galling.

Any of our representatives will be glad to show you how these advantages help you beat production schedules and costs. Phone today for a conference, or write us direct for a definite proposal.

GET ALL THE FACTS on Rockford Hydraulic Shapers. Send for our bulletin No. 201A.

520 Hy-Draulic

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET · ROCKFORD, ILLINOIS

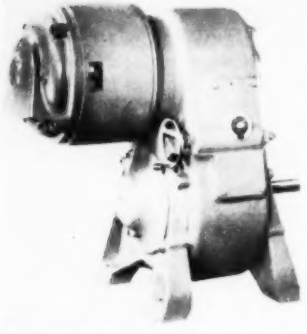


Owatonna Pedestal Press for Use with Hydraulic Ram

This press may be temporarily or permanently installed in a convenient place near permanent equipment to perform pulling or installing jobs, the base being only 20 x 21 in.

Designed for use with the Power-Twin 17½-ton ram for pulling wheels, pulleys, bushings, collars, couplings, gears, shafts and bearings.

Owatonna Tool Co., 383 Cedar Street, Owatonna, Minnesota.



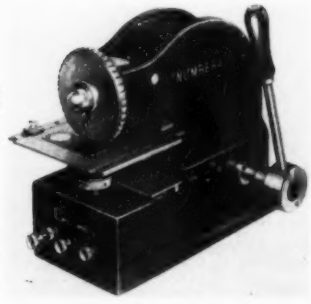
Sterling Variable Speed Drives

Speed-Trol electric power drives are being put out in larger horsepower. The unit illustrated is the Drip-Proof —which prevents liquids or any foreign materials from falling into the motor. The housing and the variable-speed transmission case are made of gray-iron castings which provide protection against corrosion.

The features of this unit are positive adjustment of pulleys, infinite speed variation, and accurate control of speed under varying loads.

The series will range from 20 to 25 hp. They will be available in splash-proof and totally enclosed fan-cooled models, and with built-in reduction gears for the lower speed ranges. All models can be supplied with manual control, electric or mechanical remote control.

Sterling Electric Motors, Inc., 5401 Anaheim-Telegraph Road, Los Angeles 22, Calif.



Number & Lettering Detail Press

This press comes in three models—the 141 for hand-operation; the 142 for air; and the 143 which is motorized. Operation of the hand model is as follows: the work is placed under a clamp on the rear of the table. The table is adjusted upward by turning the knurled nut No. 5 to the left until there is a clearance of approximately ¼ in. between top of table and bottom of dial. Table clamp is released, and the table slipped forward until the dial is located over the object. Tighten clamp. To move table right or left button No. 2 is pushed, releasing the table.

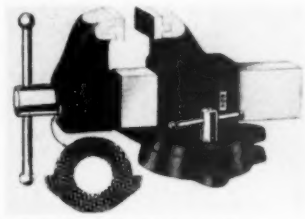
To obtain depth of impression, bring operating lever forward, turn knurled nut No. 5 to the left until dial and material to be stamped touch. Push button No. 2 to prevent table movement. Release operating lever, turn nut No. 5 to the left slightly until proper depth of impression is obtained. To regulate automatic spacing between characters, turn knob No. 1 right to increase spacing, left to decrease. For manual spacing knob No. 3 is pushed. To regulate the spacing to a given distance, knob No. 4 is turned to the right to increase, left to decrease.

The air model is regulated and adjusted the same as a hand operated—opening air valve instead of pulling hand lever forward.

The motorized model is operated by a gearmotor. Its operation is somewhat the same.

The press will stamp all soft metals and also mild steel. Stamping pressure is applied by eccentric action through the lever to the head.

Numberall Stamp & Tool Co., Huguenot Park, Staten Island 12, N. Y.



Columbian Machinists' Vise Employs Thrust Bearing

One of the features of this vise is a graphite-bronze, self-lubricating thrust bearing located at the front of the sliding jaw. This is claimed to (1) absorb thrust of the steel screw head, (2) prevent wear, and (3) eliminate end play. Practical feature is the steel ball handle ends which are forged from the handle stock itself. These, therefore, cannot come loose.

The vises are made of malleable iron castings that come in standard sizes, and with 3- to 8-in. jaw widths. The hardened tool-steel jaw faces are pinned into the castings so they cannot come loose in use, but can be easily replaced if chipped or worn.

The Columbian Vise & Mfg. Co., 9021 Bessemer Ave., Cleveland 4, Ohio

Fine-Grain-Size Brass Is Harder, Stronger, Springier

Formbrite sheet, strip, wire, rod, and tube involves a special procedure of rolling or drawing and annealing to obtain exceptionally fine grain size.

The brass contains between 63 to 90% copper and despite being harder and stronger is reported to have good ductility.

The fine grain structure is said to provide metal with a surface so smooth that a simple buffing operation is all that is required to produce a bright finish.

The American Brass Co., Waterbury 20, Conn.

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Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

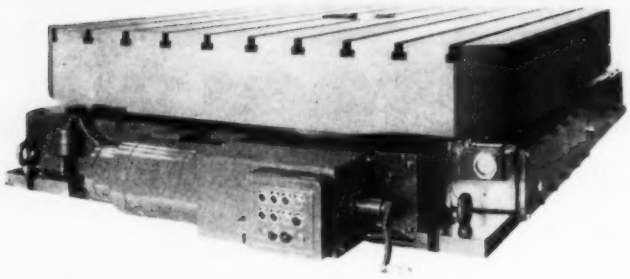
● **National Tool Co. engineers are backed by years of successful experience in special tooling and related problems. Their assistance is yours for the asking—whether you're interested in one tool or the tooling program for a whole plant.**

A PARTIAL LIST OF *Special* TOOLS ENGINEERED AND MANUFACTURED BY

Gear Shaper Cutters	Milling Cutters	Chamfering Cutters
Herringbone Gear Cutters	Broaches	Rotary Gear Cutters
Ground and Unground Gear and Spline Hobs	Tungsten Carbide Tools	Circular Form Tools
	Sprocket Cutters	Gang Cutters
Master Gears	Profile Form Mills	Flat Form Tools

NATIONAL TOOL CO.
Cleveland 2, Ohio

Representatives in major industrial centers



Hydraulic Revolving Table Takes Loads Up To 150,000 lb

Table size	84 x 96 in.
Over-all height	27 in.
Weight-approximate	37,500 lb
Load capacity	150,000 lb
Size T-slots	1¼ in.

The table is a heavy duty with a powerful hydraulic lift for raising the table top a few thousandths from its bearing. The lift is supported by a large anti-friction thrust bearing, making for easy revolving, even under full load. Even with an unbalanced load, adjustment is easy.

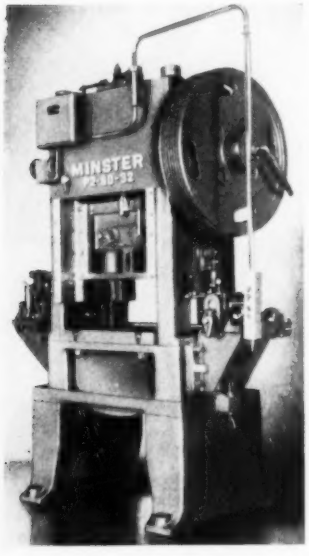
Electrical interlocks are used between the hydraulic clamping device and the table-raising mechanism as a safety device making it impossible to raise the top when clamps are in operation. The hydraulic system is built into the unit.

Pushbutton control provides power rapid traverse in either direction through a high torque motor with magnetic brake. Non-metallic bearing surfaces are used between table top and base.

Lubrication is by means of a pressure system with metered units at each oiling point, a pump-driven circulating system, and an oil bath for some transmissions.

The rotary table, designed for use with either table or floor horizontal boring, drilling and milling machines, can be adapted for use with other machine tools.

Ohio Machine Tool Co., Kenton, Ohio



Automatic Presses Have Variable-Speed Drives

An automatic production press designed to produce intricate stampings with progressive dies is available in capacities from 20 to 150 tons from the Minster Machine Co.

Called the Piecemaker, the press is of box construction. Base, uprights, and crown are held in alignment with cross keys, four heavy steel tie rods are shrunk in place to a definite preload and hold the assembly together. The high-tensile semi-steel provides vibration-dampening qualities.

The presses are equipped with the flywheel combination air-operated friction clutch and brake for die protection. The torque of the clutch is applied directly to the crankshaft and is controlled by regulating the air pressure applied to the clutch. The air pressure is preset to do a specific job and will stall on a doubleheader, protect against overload, and eliminate tool impact shock. The clutch and brake is controlled by a solenoid-operated valve through an electrical circuit. It is reversible and non-repeat in case of power or air failure.

A double-throw full eccentric shaft provides maximum bearing length. Selection of variable-speed drives is optional; Louis Allis Adjusto-Spede, Reeves Motodrive, and U. S. Varidrive being those recommended.

Rack-and-pinion-driven single or double roll feeds are available. Pads for feed mounting are machined on both ends of the press.

All wear parts subject to pressure are bronze lined. Shaft, main, and eccentric bearings use split nickel-bronze bushings, lower connections are of saddle nickel-bronze plug inserts and may be shimmed to overcome wear. The slide has fixed bronze wear plates against which the gibs are permanently set front to back, and movable bronze ways for left to right alignment. Flywheels are mounted on anti-friction bearings.

Lubrication is automatic, models up to 100-ton capacity using a cycle system operating on set periods of high pressure, on models up to 200 ton a force-feed continuous system is used.

The slides are mounted on pneumatic counterbalances and use rapid manual adjustment, locked by tailstock clamp.

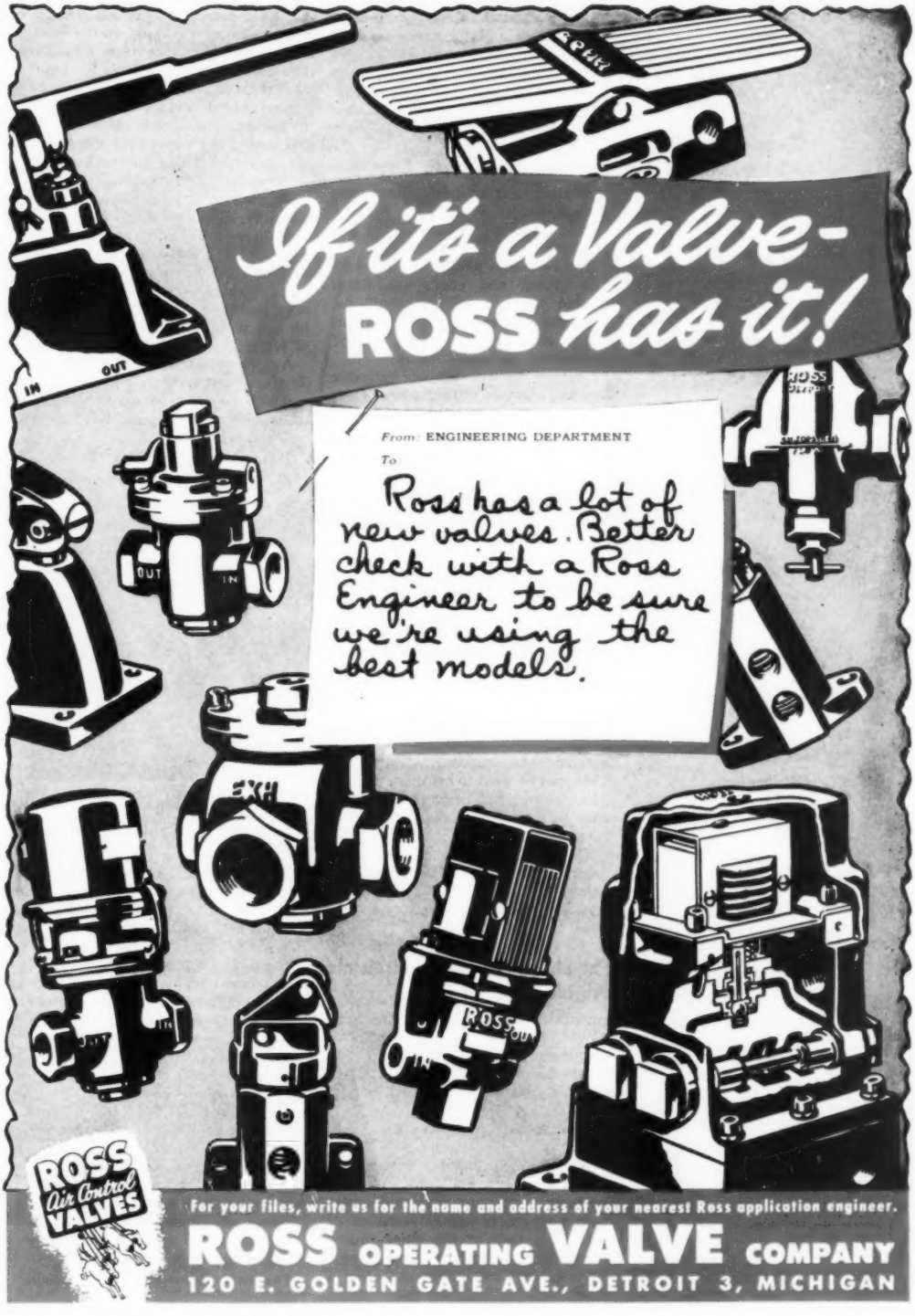
The P2-series presses are available in 6 models with capacities of 30, 45, 60, 75, 100, and 150 tons. The speed of press is variable up to 400 strokes per minute depending on the model.

Minster Machine Co., Minster, Ohio

The Arnold Lubricator No. 2 with ½-pint oil capacity has been designed for lubricating pneumatic tools. The lubricator, when placed in the air line, supplies a flow of oiled air to the working parts of the tool. An adjustable feeder enables the operator to vary the oil flow to the needs of the job. Oil may be added under line pressure; a pressure-proof window enables the operator to tell oil level.

Made of lightweight alloy, the lubricator causes no drag on the air line and its shape (narrow and streamline) allows it to be pulled around corners without catching. It is 7 in. long, 3½ in. in width and height, and weighs 32 oz.

The Rucker Co., 1228 Hollis St., Oakland, Calif.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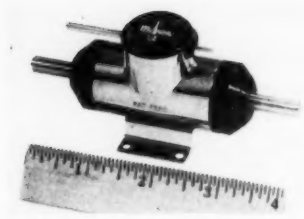


Miniature Variable-Speed Drive Has Push-Rod Control

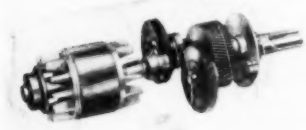
Ratio is controlled on this drive by the employment of a simple pushrod. Through the use of the extended pushrod, levers; cams, or any properly applied linkage, a wide variety of controls is possible. Extension of the pushrod makes remote lever control possible, and remote ratio indication, on a scale of any size, is obtained by a scale on the speed adjuster.

Known as the 4C, it is the same size and construction as the Type 4A unit which has thumb-screw speed adjustment. Completely sealed, the drive has ratings up to 72 oz. in. torque, 0.025 hp., 20,000 rpm, and an infinitely variable ratio from 1/6 to 6.

Metron Instrument Co., 432 Lincoln St., Denver 9, Colo.

Anti-rust paint is said to be equally effective in preventing rust on new metal or stopping rust action on present rusted metal. It can be applied over rust without extensive surface preparation. Upon application, it penetrates through the rust layer into the base metal and seals the surface against further rusting.

Paint Corp. of America, Fidelity Building, Cleveland 14, Ohio



Twin-Pinion Gear Motor

By using two secondary pinions to drive the output gear, the Type GL Syncrogear has doubled the effect of torque rating of a conventional single-pinion-and-gear unit. It uses a splined herringbone pinion to equally divide the load between the two secondary pinions.

It is available with ratings of five to 25 hp and with speeds from 30 to 84 rpm. Other features are asbestos-protected windings, normalized castings, solid-centricast rotors, and Lubriflush lubrication.

U. S. Electrical Motors, Inc., 200 East Slauson Ave., Los Angeles 54, Calif.

Saart Universal Depth Gage

Indicating depth gage allows the measurement of depths, lengths, angles, or steps to tolerances as fine as 0.00005 in. in a 3-in. length.

The reference platen is 3¼ x 4 in. The platen and edges are finish ground and are "Electrolized" for wear and corrosion resistance. This alloy, as deposited, has a 79-81 Rockwell-C hardness value.

Vertical adjustment of indicator on base, together with contact points supplied, allows depth measurement within the following limits: for 1⅛-in. contact point—0 to 1 in. plus indicator range; for 2⅛-in. contact point—1 to 2 in. plus indicator range.

Saart, Kraemer and Hanscom, Inc., 1 Washington Ave., Providence 5, R. I.

Strip-Steel Machine Pin Formed by Spiral Winding

The spiral cross-section of this machine pin was chosen because the physical properties can be varied by changing the number of coils, the thickness of the strip, and the tightness of the coil windings.

Known as Spirol, the pins can be designed and fabricated for any specific and critical application. They can be used in ordinary drilled holes, eliminating prior reaming, are easy to insert and remove, and are reusable.

The hole tolerance can be from nominal size to plus 2 to 2½% of hole dia.

Prym Engineering Co., Dayville, Conn.

Phosphate Treatment for Metals Provides Good Paint Base

Anchorite 100 is a phosphate compound used to give a uniform, corrosion-resistant paint base. It meets the requirements for a Class C (Type II) finish in U. S. Army specification No. 57-O-2C and for armed services spec JAN-C-490 Grade 1.

The chemical changes the surface of steel, iron, zinc, and cadmium parts into an inert phosphate compound which is highly resistant to corrosion. One of the chief causes for paint destruction on ferrous parts is that steel does not have a chemically uniform surface, causing galvanic corrosion between the different elements making up the steel. This breakdown produces an alkaline medium which attacks the paint film from beneath the coating. Since a phosphated surface is non-conductive, electrochemical breakdown cannot occur; the phosphate compound acts as an insulating barrier between the metal and the paint.

Application is by either immersion or spray. Zinc and cadmium require only 30 sec to 1 min in the immersion process, with some steel alloys require as much as 5 min. The treatment is said to be economical, since only a small quantity of the Anchorite 100 is added to a large volume of water.

Anchorite 100 receives largest volume application on ferrous parts but can also be used as a pre-painting treatment on zinc, galvanized iron, and cadium.

Octagon Processes Inc., 15 Bank St., Staten Island 1, N. Y.

Tubing Having High Finish Is Suitable for Cylinders

A line of tubing for use as hydraulic cylinders, shock absorbers, and applications where pressure is to be converted into mechanical movement, is now available from the Tube Reducing Corp.

The tubing is free of scratches, pits, and other irregularities which are ironed out when the tube is sized by pressure exerted between two dies and a mandrel. It is supplied in bores ranging from 1½ to 6 in. depending on wall thickness.

Because compression sizing cold-works the metal, the mechanical properties of the original tube are improved.

Surfaces of the cylinder-finish tube need no machining for use with leather or soft packing as in cup pistons. With metal piston rings, the tubing requires no boring but only a light honing operation.

The Tube Reducing Corp., Wallington, N. J.

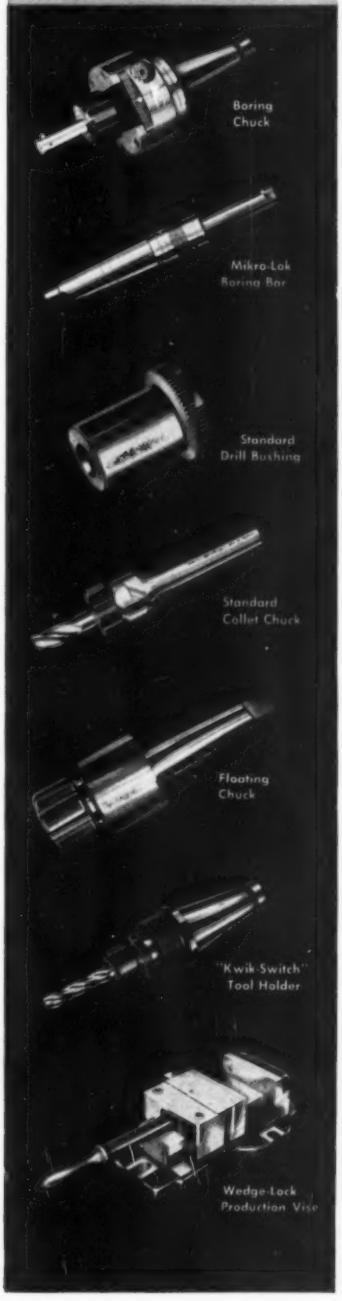
Cut Costs

ON COLLET CHUCKS WITH UNIVERSAL'S SIMPLER DESIGN

Universal's collet chuck design with only three basic parts — nut, collet and chuck . . . means lower initial cost and less need for replacements because there are less wearing parts. This design not only saves money — it also provides wrap-around action, gripping on a continuous surface *the full length of the collet.* Drills can't slip, tool shanks don't get scored, tools run true and run-out is held at a minimum. Universal Collet Chucks are *available from stock* in collet sizes from 1/16″ to 1½″, to fit any screw machine. To cut chuck costs, write to the Universal warehouse nearest you . . . 1060 Broad Street, Newark, N. J., 5035 Sixth Ave., Kenosha, Wisc., or the home office.

Exploded view of Universal Collet Chuck illustrating simplicity of design

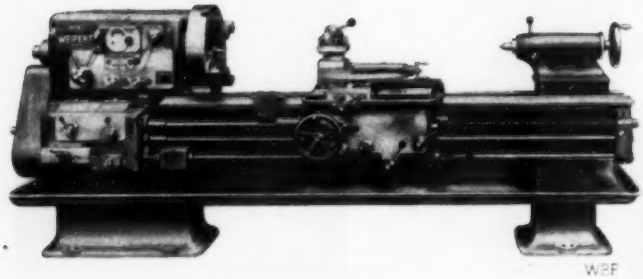
OTHER UNIVERSAL PRODUCTION TOOLS



UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 1, MICHIGAN

149



German Lathe Cuts Different Threads Without Changing Gears

These first Weipert lathes to be made available in the United States, are basically 18-in. machines raised to swing 22 in. They have 100-in. center distances.

The lathes are equipped with American-Standard long-taper-key spindle nose and with inch threads on the leadscrew. The three bearing spindle uses U. S.-made Timken bearings.

Sliding gear trains provide 18 spindle speeds up to 600 rpm, all of which are made on intermediate shafts, running on ball bearings. The spindle is driven by a single helical bull gear. All gears and splined shafts are hardened and ground. Spindle start, stop, and reversed are apron-controlled through a multiple-disc driving clutch.

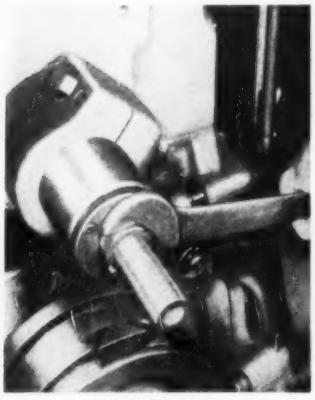
The apron housing is a double-walled casting in which all shafts are supported on front and rear bearings. Shifts from longitudinal to cross feed is made possible by sliding gears. An automatic micrometer stop, which disengages the feed, is used for both directions of longitudinal feed. Backlash is prevented by a split cross-slide nut. The compound rest will take any kind of tool holder although a four-way tool post is standard equipment.

The quick-change box allows 44 feeds and threads, two additional feed ranges in ratios of 1:4 and 1:6 are controlled by a single lever. Module, diametral-pitch, metric, and inch threads may be cut simply by a two-lever adjustment without changing gears. Sufficient lead makes oil grooving possible.

Self-compensating ways consisting of one V and one flat, are used. Recommended motor size is 7½ hp. The bed is deep and insures rigidity under heavy tool pressures through strong diagonal ribbing.

The lathes are fully equipped with steady rest, compound rest, chip pan and other accessories. Repair parts will be available.

Laurens Bros., Inc., Cincinnati, Ohio



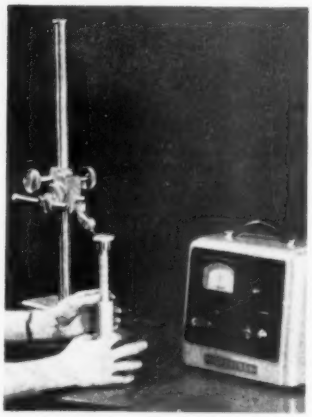
Adjustable-Stroke Center Bar Available For Fay Automatics

An adjustable-stroke center bar is now available as optional equipment on all sizes of Fay automatic lathes. This permits the operator to change carriage stroke without changing feed cams.

It is essentially a screw which moves the roll carrier along the center bar when the nut is adjusted. The relationship between screw change and stroke change is direct, so stroke length can be measured on the screw which projects from the center bar.

This addition reduces stroke changing to an operation requiring only a few minutes and thus speeds setup time, making the Fay more flexible for short runs.

Jones & Lamson Machine Co., Springfield, Vt.



Electronic Height Indicator For Toolroom and Inspection

An electronic height indicator has been designed for use in the toolroom and for receiving, process, and final inspection where accurate measurement is desired from a surface-plate reference. Measurements may be taken from above or below a surface without reversing the clockwise movement of the indicator hand from the minus to the plus side of zero on the scale thus reducing setup time.

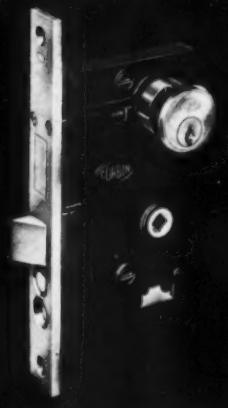
An electronic gagehead with dual 1000/2000 to 1 amplification, smallest graduation 0.0001 in., a balanced scale of ± 0.0015 and 0.003 in. respectively, gives a positive and accurate reading. The gage has a vertical capacity of 0 to 26 in.; throat capacity—gaging point to edge of column rack 4½ to 11 in.; and throat capacity—gaging point to edge of base 3½ to 10 in.

A sensitive adjustment knob on top of the pickup unit, provides a maximum adjustment of 0.010 of the gaging stylus. The mounting bracket is adjustable vertically on the column to any point within an 18-in. range by means of a rack and pinion. The pickup head can be rotated and locked in position at any point within a full range of 360°. The extension arm can be adjusted horizontally to bring the pickup head to any point 4½ to 11 in. from the column. It is also adjustable radially within a range of 345°.

The Sheffield Corp., Dayton 1, Ohio

CrysCoat

is in Good Company!



*Prepares Metal Surfaces for Painting

*Patented Material and Process

THE name CORBIN on a lock stands for unsurpassed excellence in hardware crafting and rugged construction. To Oakite CrysCoat is entrusted the important task of protecting the lock mechanism and case against those invading elements that cause corrosion and mechanical breakdown.

The Oakite CrysCoat Process may be just what you're looking for. With minimum equipment . . . in minimum time . . . at minimum cost you can (1) clean metal surfaces and condition them for painting; (2) improve the adhesion of paint to metal; (3) prevent corrosion before metal is painted; (4) localize corrosion under paint if finish is broken.

The Oakite CrysCoat Process Offers These Extras:

1. **Eliminates operations... uses less equipment**
2. **Cuts operating time**
3. **Uses less chemicals for cleaning and conditioning**
4. **Reduces heating costs**
5. **Saves cost of expensive acid-proof tanks and equipment**
6. **Saves cost of frequent descaling and desludging**
7. **Drag-out costs are less because of low original cost of solution**
8. **Saves paint**
9. **Cuts cost of rejects caused by rusting before painting**

FREE . . . illustrated folder describes the Oakite CrysCoat Process for use in before-paint-treatment of steel, aluminum sheet and castings, zinc die castings and galvanized surfaces. If you are engaged in the fabrication of civilian goods or the speedy production of defense orders—send for Folder F7642.

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ROUND TABLE Discussion

GOOD FOR EVIL

THE PROBLEM of knowing what to do in a case such as that of Smedley's needing a recommendation is really a tough nut to crack. Surely the company who is hiring him should know that he has a temper. But how to put it across without stopping Smedley from getting the job is the hard part.

Possibly the fit of temper which flared up on the job might have been caused by many things. It could have been a personality clash, a bad home condition, illness or a case of jangled nerves. Yet how few of us who are faced with the problem of writing letters of recommendation take these things and other phases into consideration. No, we prefer to condemn the man if we have had a clash with him. We like to exert our influence. We think it makes us a big shot when actually it merely shows how small we are. Now it is true that a man's ability to get along and keep on an even keel of disposition day in and day out is one of the key points in successful supervision.

Ed should not condemn Smedley for he is also hot-headed and yet he considers himself a good foreman. But is he? Would Smedley and Ed have had an argument if Ed were even-tempered and knew how to control men? It is doubtful. No, Ed cannot truthfully write that because Smedley is hot headed he would be a "no-good foreman" without actually hanging himself. No, the fact that Smedley walked out on an unfinished job may be much more important than his temper. Perhaps this shows a trait of his character of not being able to take it under strain without blowing up.

This trait is one that too few foremen who have not been given foreman training fail to have. This causes many shop difficulties with labor. It causes foremen to pick arguments with workers. Temper is now always included in this trait. It is a method of finding a way out.

It is better not to let personal feelings enter into a recommendation for a man. Place the cold facts on the table. Do not color them. If you feel that the man was wrongly used and fired or quit without cause be sure that such comments are carefully worded. A good word costs no more than a bad one. Remember

that some day, you perhaps, may also have need for a recommendation. Think what you would like to have your boss say about you, when you are the one looking for a new job. Don't try to play the big shot and write reams about the man. Be short but be complete. Point out traits, ability and how he got along with other men in the shop. Don't try to sway your reader, give him plain facts and let him judge for himself whether or not he wants to hire the man. The running down of a man because of spite never gets anyone a bigger job. Too often your contacts with the man must continue and sometimes he might even become your boss. It is wise to remember and personally practice the Golden Rule.

Charles D. Townsend
W. Hartford, Conn.

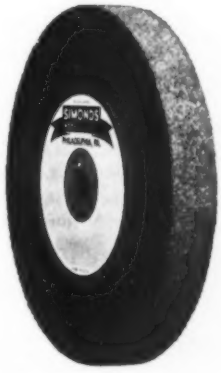
•

IN THE CASE under discussion, where both the worker and foreman "blew their tops" resulting in the worker quitting, it seems that the decent thing to do now, as far as references are concerned, is for the foreman to forget the incident and furnish references based on the man's past ability. What's done is done, and the foreman should be big enough to take the first step toward rectifying the situation. The employee for whom recommendations are being requested, demonstrated his capability as an efficient and able worker. The fact that he blew off steam on one occasion is no justification for wrecking his chances in a new job.

Any foreman who allows himself to become involved in an argument with a subordinate is exposing his own incompetence. It is utterly impossible to argue anyone around to your point of view voluntarily. The other person is usually so busy trying to defend himself that he isn't even listening to you. One foreman I know who triumphantly hauled out a company manual to prove to an assistant that he was wrong won the point—but lost an admirer. Any tactless criticism always humiliates the receiver so much that it does more harm than good. Tongue-lashings do more, I have found, to distract employees from successful performance of duty than almost any other factors.

The foreman should forget the alleged wrong and return good for evil. To carry the grudge to the point of furnishing unsatisfactory references based on one unfortunate and ill-timed flare-up of the former employee would benefit neither the

How to get grinding wheels exactly suited to his jobs! That's his problem, and he's looking in the best place for the right answer . . . Simonds Abrasive Company's Grinding Wheel data book. It describes Simonds complete line and lists everything *you* need for top grinding efficiency . . . grinding wheels of all sizes, mounted wheels and points, segments and abrasive grain . . . accurately specified and made by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for data book and name of your distributor.



SIMONDS ABRASIVE CO.
Grinding Wheels

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

originator or the subject of the references.

Being a good boss is a problem. Many foremen are accustomed to giving orders with no back talk, making decisions abruptly without consultation and snorting fire whenever anything goes wrong. One of the first principles of good supervision is to remember that employees are human beings. If they are humanly treated they will respond by giving their best. Of course, no matter how well run a department may be, it is impossible to foresee all the human problems and frictions that may arise. The foreman cannot always anticipate the specific problem, but he can develop sound procedures for dealing with human problems when they do occur. He certainly should hold his criticism in check long enough to be sure it is constructive and just. The wise foreman will also postpone his reprimand until both he and the worker are composed. If the foreman wants the worker to be cool-headed about his own troubles he certainly should not reprimand the man in anger. Reprimands of an irritated foreman usually have little constructive effect because the employee's attention is focused on the foreman's anger rather than on the problem in question.

A good commandment for a foreman, and candidate for foreman, is to assume good-will on the part of the other person. Let him take the first step in failure to cooperate. Do not assume his ill will and thereby make for him the decision of failure to work properly. Give him the benefit of the doubt. A good foreman keeps himself under control. No man can lead others who

"I wonder if you could use me during the seances—I do a little tapping down at the shop?"

UNITCAST PRESSES

. . REDUCE FINISHING TIME—
. . GIVE MINIMUM TOLERANCE LIMITS!

Shown above are three presses ranging from 250 to 600 ton capacities, another important part of Unitcast's facilities that add quality to the product.

- Do your castings assemble freely and within tolerance limits?
- Do your castings fit machining fixtures properly, consistently?
- Are your finish allowances held to a minimum?

INTERCHANGEABILITY has long been recognized as the forerunner of mass production. Unitcast daily production is held to the specified dimensional tolerances, assuring you this very important advantage.

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Give us a chance to offer a "cast steel" answer for your parts problem. Our suggestions while your product is in the design stage will pay continuous dividends. Write or call today. Unitcast Corporation, Steel Casting Division, Toledo 9, Ohio. *In Canada:* Canadian-Unitcast Steel, Ltd., Sherbrooke, Quebec.

UNITCASTINGS ARE FOUNDRY ENGINEERED

GOOD TOOLS SINCE 1836

HELLER

NUCUT WAVY TEETH FILE

Reg. U.S. Pat. Off.

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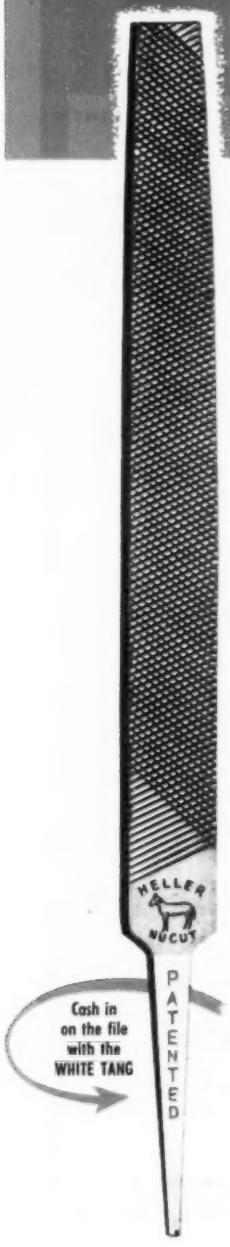
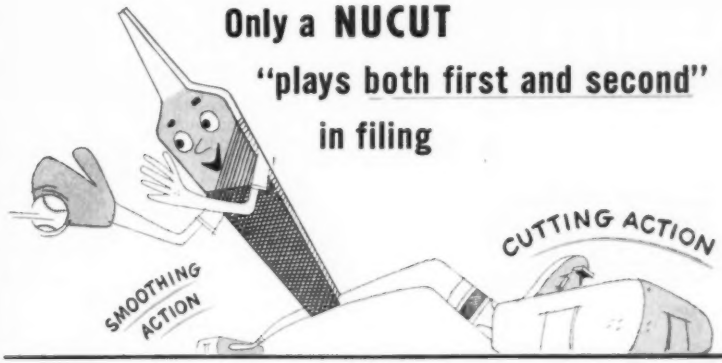


Cash in on the file with the WHITE TANG



Only a NUCUT "plays both first and second" in filing

1st. CUTTING ACTION
2nd. SMOOTHING ACTION

At every stroke

IT'S LIKE using two files instead of one when you work with a NUCUT. For a NUCUT has *two* sets of teeth — one coarse, the other fine . . . scientifically positioned in a patented wavy pattern.

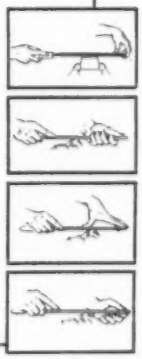
And what a difference this exclusive construction makes! The coarse teeth bite fast, clean, without scraping or skidding. The fine teeth smooth the surface *with the same stroke*. Result: better filing, faster, with less effort.

See your industrial distributor. He'll show you the sizes, shapes and cuts for getting the best results on *your* work.

HELLER BROTHERS COMPANY
America's Oldest File Manufacturer
Newcomerstown, Ohio

Right way to hold a file

Hold handle with right hand and tip with left hand. Position of left hand varies with job.



(1) FOR GENERAL FILING: Let right thumb lie along the top of handle and fingers curl around handle in a natural grip.

(2) FOR REMOVING STOCK RAPIDLY: Let ball of left thumb press upon top of file, and fingers wind around file.

(3) FOR FLAT FILING: Note extended position of thumb and fingers on top of file.

(4) FOR PRECISION WORK: The grip shown allows maximum guidance and control.

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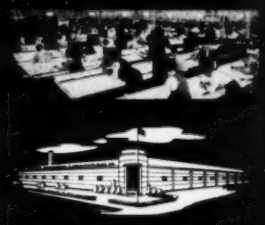

PIONEER ENGINEERING

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ENGINEERS, DESIGNERS, CONSULTANTS AND PRODUCTION SPECIALISTS

19651 JOHN R STREET
DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED

has lost control of himself. The quiet, insistent individual who cannot be swept off his feet or "blow his top," who convinces other people that he knows where he is going and how to get there, needs no words to describe his leadership.

The good foreman discriminates between the materials he works with, namely, machines and men. The machine will always act in the same way provided you do the same things to it. The man is made of something vastly different. He has pride and ambition, he can be hurt, not only physically, but mentally. Good leadership recognizes the frailty of human effort and makes allowances for it.

Harry Kaufman
Philadelphia, Pa.

•

ON THIS DISCUSSION between Al and Ed about Smedley. Al is right that Ed should have controlled his temper and tried to quiet Smedley before he got angry enough to call him a hot-tempered jackass.

A foreman's job is to keep his men satisfied in every way possible. He must make a study of human nature as every man under him has a different reaction to his personality.

Ed must have had plenty of time to know how Smedley would react to certain conditions.

Being one of his best men, he must have worked for him for some time, therefore he should have taken him aside, had a talk with him and tried to straighten out whatever bothered him.

Smedley was also wrong in walking out in the middle of a job, which proves he might not make a good foreman unless he learns to control his temper.

Ed should give Smedley a good reference as a mechanic and let it go at that. Smedley may take over a job as foreman and profit by his experience with Ed and have no trouble with his men.

Ed would not gain a thing by giving a poor recommendation and after he cooled off would regret his action in making a remark which was probably said in an angry moment.

C. W. McLarty
Brooklyn, N. Y.

•

TO CONDEMN SMEDLEY, the workman, for his burst of temper is not only unfair on the part of Ed as a foreman, it is ridiculous. In still carrying a grudge over the incident Ed gives further indication of the major fault being his. The

PUMPS

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POSITIVE DISPLACEMENT AND IMPELLER TYPES

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J. I. C. STANDARDS OR DIRECT MOTOR CONNECTED

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most accurate in the world today...

No other lathe collet chuck is as accurate as Jacobs' Spindle Nose Lathe Chuck. Extra-tight, uniform grip delivers two to four times more torque than split steel collet chucks. Designed not only for heavy-duty turning but also for chucking thin-walled tubing, plastics, wood and other fragile articles without marring, scoring, denting. Permits maximum feeds and speeds.

now...11 do the work of 88

Eleven unique Jacobs Rubber-Flex Collets do the work of 88 split steel collets and will chuck any bar from 1/16" to 1 3/8" diameter. Each collet has a capacity of a full 1/8" range. Extra long steel jaws are always parallel to and in full contact with work. Bonded together with Hycar Synthetic Rubber which will not set and is not affected by heat, coolants, cutting oils.

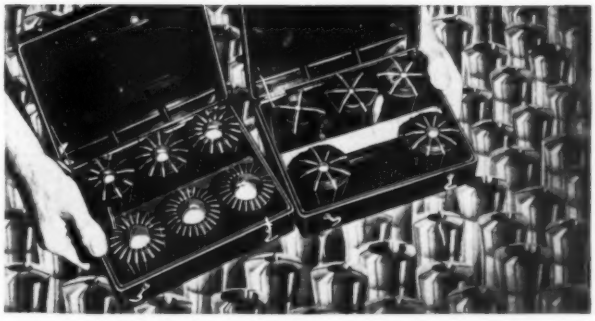
See your Industrial Distributor for Bulletin 50LC giving complete information on this amazing chuck.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A

JACOBS

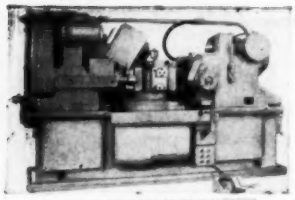
IT HOLDS



Jacobs Rubber-Flex Collets are used with Jacobs Spindle Nose Lathe Chuck

GOSS and DE LEEUW

AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.

The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

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MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

transfer of his smallness to paper and thence to another company in a reply to a reference request from the firm where Smedley is making application, represents such a violation of business ethics as to make Ed himself fit subject for prompt dismissal.

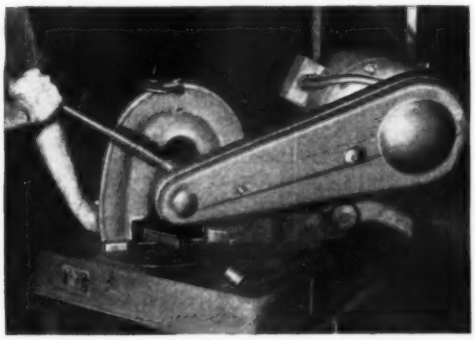
Fortunately we are spared any sympathy or worry over Smedley's prospects of having his hiring at the new place adversely affected by this recommendation - in - reverse. Most men as familiar with psychology as an employment manager should soon become, would recognize this blast for just what it is. Chances are it would serve to tip the scales quickly in Smedley's favor because right or wrong, before or during the blow-up, Ed, the foreman, sure is dead wrong now.

If ever a man is entitled to lose his temper on the floor of a shop, he loses that privilege the minute he dons the mantle of foremanship. The controlled wrath of a drill-sergeant expressed in the picturesque, smoking, vehement tongue, once the trademark of a career muleskinner, is an art all men cannot master. Whether it accomplishes by domination, fear or unconscious admiration on the part of the person subjected is of little consequence. The main thing is, it does the job. This is not so important in itself nor is it to be construed as unreserved commendation for a flame-throwing tongue. What is important is the failure of too many people, great and small, to recognize the very distinct difference between it and a burst of uncontrolled temper. A

"It's wonderful how that machine reduces operator fatigue!"

3 TESTED WAYS

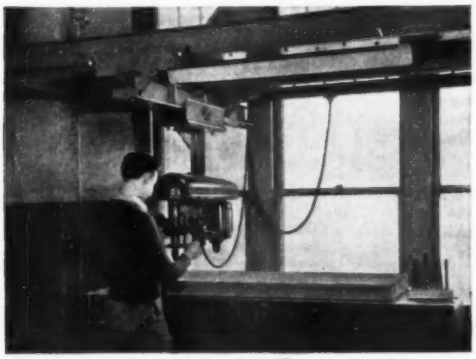
to Save Time, Space or Handling with DELTA Tools



Automotive moulding cut-off speeded 1000%

FOUR WHEEL DRIVE AUTO COMPANY . . . .

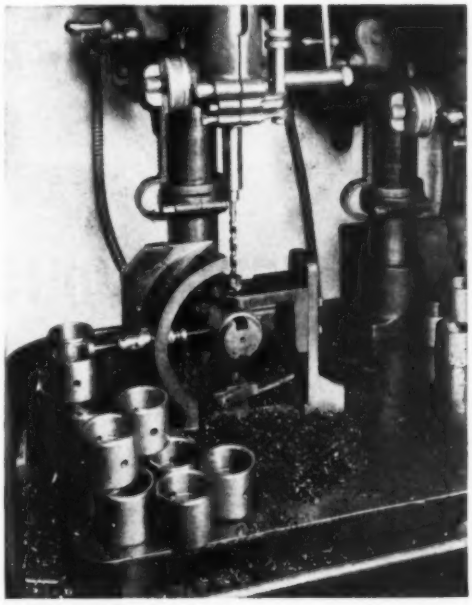
Clintonville, Wis. All metal moulding used for truck cabs is cut on Delta abrasive wheel cut-off machine, with ten times faster production. Previous hand cutting methods entailed great operator fatigue and required a deburring operation. Delta cut-off machines are also available with saw blades for non-ferrous work.



Overhead mounting for Delta drill press reduces handling of bulky panels

KIRKHOF ELECTRIC CO. . . . Grand Rapids, Mich.

With an overhead crane mounting, a Delta 17-inch drill press will drill holes in any location on 36" x 96" switchboard panels without moving the panels. Both the drill head and bridge are suspended from ball bearings riding on flat cold rolled bars; and the whole framework is supported from the building steel structure for a clear field of operation. Panels are 1½" ebony asbestos or ⅛" steel.



With one fixture, Delta drill press handles 57 different parts—REED-PRENTICE CORP....

Worcester, Mass. A single ingenious jig, easily and quickly adjustable, is used to drill equally spaced holes in 57 different parts, with a big saving in tool storage space and manufacturing time. An arbor-holding bracket is adjustable horizontally and vertically, and an indexing pin in a double quadrant, inserted in the first hole drilled, locates the next hole accurately

Delta users originate many unique and practical applications because Delta tools are so adaptable to so many jobs. Your Delta dealer will help you fit them to your own machining requirements. He's listed in the classified section of your phone book —under "Tools."

There's a Delta Power Tool for Your Job-

WOOD OR METAL WORKING

53 MACHINES — 246 MODELS — MORE THAN 1300 ACCESSORIES

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Rockwell MANUFACTURING COMPANY

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UP GOES PRODUCTION
DOWN GO COSTS
the
WENDT-SONIS
Way
Increase your profits by using W-S Standard Carbide Tipped Tools. Perform over 80% of your machining operations with just a few standard tools. Inventories and procurement costs are reduced to a minimum the Wendt-Sonis way.
W-S tools are made with the grade of carbide best suited for the job. All W-S tools are color-marked for easy identification. Tool shanks are rust-resistant and made from highest quality steels. Available from stock at your W-S distributor.
FREE! NEW CARBIDE EQUIVALENT CHART
Send for new chart showing carbide manufacturers' grade recommendations. Using this chart will bring you better service . . . faster delivery and lower pricing. Write WENDT-SONIS COMPANY, Hannibal, Missouri.
WENDT SONIS
CARBIDE CUTTING TOOLS
BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS
DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS
ROLLER TURNING TOOLS • SPECIAL BITS

mind out of control is fit subject for only two things, derision or sympathy. Neither one attributes to leadership.

One should not fear that because Smedley lost his temper at the workman level, he will do so again as a foreman. Sheer frustration is a flame to the tempers of all of us. Often it is the only one hot enough to "blow the top" on fellows with renowned high-boiling points. They will reason and discuss, using this maneuver and that, avoiding argument for argument's sake alone. But when the other fellow pulls rank and is ugly about it, to try and force upon you that "black is white and red no color at all"—the temper of a saint won't stand it.

Unfortunately there are too many executives at large today whose tempers leave much to be desired. They have tried to carry into the higher echelons of business the same technique a sergeant uses with success because his contact is direct. This blistering leadership carried to high levels where only the reverberations and all of the heat, with none of the directness, trickles downward through the channels losing any possible good as it goes—should be abandoned. It is known as the policy of fear. Keeps people afraid for their jobs, on their toes for self-preservation and not the task at hand. Earning as it does for these bosses the appellation of being "mean and cantankerous," where under other circumstances they are due respect and even admiration for their accomplishments. To those beneath, the surface example is bad—but because it is apparently a necessity to success becomes imitated. As with all other things the imitation is far worse than the original. A top directive for good, soon gets altered to evil by these characters. It is this type, apparently such as Ed, who because of inherent meanness finally force a good man to quit and lose no opportunity to knock him after he's gone. Making it apparent sooner or later that this is a cover-up for his own shortcomings. In these cases there is no need to hope from Ed's for some "Good for Evil." The Smedleys usually get it anyway. While Ed raves on about a "bullheaded moron" Smedley has a new job—often at twice the pay.

Austin M. Elliott
Lockport, N. Y.

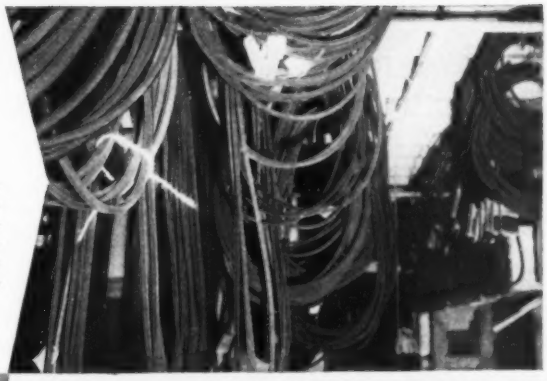
•

LOST DIAMOND MYSTERY

IT IS a very ticklish problem to try to get an employee to pay for a lost or damaged tool. During the

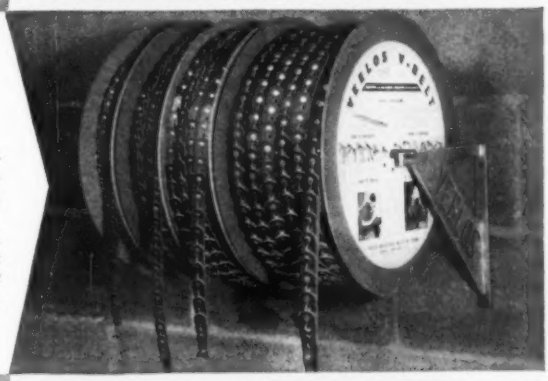
You Waste Money Here with Endless V-Belts...

because it takes *extra* dollars to keep a complete stock of different sizes of endless v-belts . . . *extra* dollars to provide adequate storage space . . . *extra* dollars to maintain an accurate inventory control . . . and *extra* dollars in an inventory of belts that may deteriorate before they can be put into service.



but You Save Money Here with Veelos V-Belt...

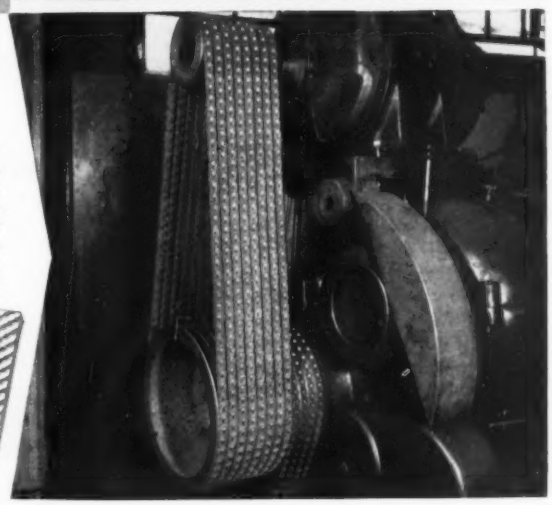
because these 4 reels of Veelos *adjustable* v-belt in the O, A, B and C widths will replace up to 316 sizes of endless v-belts. Veelos on reels is easy to store on the wall or floor . . . easy to control, for a glance tells you stock on hand. And Veelos holds inventory investment dollars to a minimum while providing *the right size v-belt when you need it*—without delay, without deterioration.



and You Make Money Here on Continuous Production...

because Veelos *keeps* your machines producing. Profit-killing downtime for belt installation is practically eliminated. Veelos installs quickly —on some drives in less than one-tenth the time of endless v-belts because it is unnecessary to dismantle outboard bearings. Simple adjustment permits easy maintenance of uniform tension on all belts . . . assures constant, vibrationless, full power delivery.

For the complete story on Veelos, the adjustable v-belt, write for your copy of the VEELOS DATA BOOK.

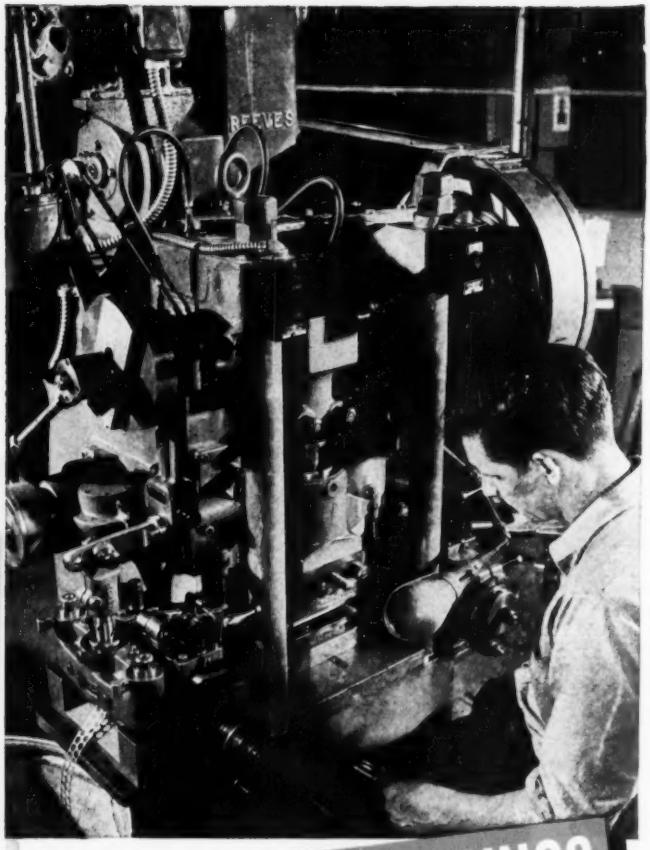


VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in A and B. Package on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

MANHEIM MANUFACTURING & BELTING COMPANY, MANHEIM, PA.



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Manufacturers of the famous ***LAMINUM*** *shims that peel for adjustment*

course of a year, the employer has a large cost for replacing perishable tools but the cost of the product should cover this deductible item. When it comes to precision tools and capital equipment he must take steps to protect his property. There are many systems in effect to control the situation but not many do the job they are supposed to do.

Few places that I have worked in acually deducted lost or strayed items from my pay, although they threatened to do so. An employee will not play nursemaid to the company's tools as well as he does his own personal property. If he loses some of his own tools as well as the company's, it might be possible that another employee is pilfering the tools and it is the company's responsibility to uncover the culprit instead of punishing the victim.

If an employee is consistently careless, it will be wiser to let him go, than wait until he misplaces more than is covered by his pay. Over a period of years, every toolmaker at one time or another has misplaced or damaged company equipment. It is the experienced man who knows how to cover up his error or carelessness.

I have heard of employees purchasing tools that they damaged and replacing them so that the company would not know about it. I also remember one fellow who chipped a piece of milk bottle to replace a diamond that he had carelessly lost. These incidents are caused by the worker's conscience and not because of their obligations.

Many times a worker misplacing a tool will borrow another from a fellow employee to cover up his shortage. The other worker will wait for his chance to pick up another to protect his record. Sometimes the tool crib will wind up with an extra tool that doesn't show on the inventory record because the original tool was turned in and one of the employees substituted another that he bought or had.

Frank J. Zarnowski
Rutherford, N.J.

•

HAVING a man pay for lost diamonds, damaged machinery, etc., may be a morale-lowering practice indulged in by one whose outlook in life is decidedly small. Such a person usually has a badly distorted perspective as to what constitutes lasting values. He usually conceives of the magnitudte of dollar values through penetrating eyes.

While Ed must have been highly perturbed at this chap, for making

NOW! stainless cast fittings from CRUCIBLE STEEL!

Stainless cast fittings . . . such as made for Alloy Stainless Products Company, Paterson, N. J. . . . shown above . . . are being produced for Industry at Crucible's Specialty Steel Foundry—Harrison, New Jersey. These fittings find ideal application in such diversified activities as: Atomic Energy Commission; Chemical, Oil, Pharmaceutical, Textile Industries.

Pioneer in the development of stainless steels, Crucible is casting these high quality fittings in Types 304, 316 and 347 stainless. Made under the most exacting metallurgical supervision and radiographic control, these castings are entirely free of porosity, internal shrinkage, or other casting defects. The castings are furnished annealed, blast cleaned and passivated for maximum corrosion resistance.

The high casting quality plus the particularly husky design make the Alloy Stainless Products' pipe fittings among the leaders in the field.

In addition to stainless cast fittings, tool steel and alloy steel castings are made at the Crucible foundry to meet the requirements of hundreds of Industrial applications. And remember too, our metallurgical staff is freely available to you. If you have a need for castings—check with Crucible.

CRUCIBLE first name in special purpose steels

51 years of Fine steelmaking **STAINLESS CASTINGS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

FIGURING TOOL COSTS ON PERFORMANCE . . . NOT PRICE, PAYS BIG DIVIDENDS

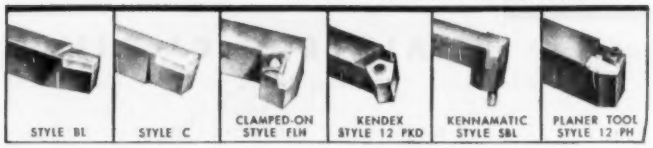
Productivity not pennies is the only way to judge the cost of a tool. No tool deserves a place in your shop unless it can prove . . . on the job . . . that it will enable the machine to operate at peak performance, with minimum downtime.

Kennametal cemented carbide tools are made by processes that are exclusive and expensive, but which are worth far more than the cost . . . because they assure a tool material of consistent soundness.

This Kennametal characteristic pays off in your shop. In many instances, Kennametal tools will pay for themselves in savings effected in grinding, alone. And this does not take into account reduced tooling costs, and improved production rates attained.

We'll send you, on request, reports that show cost reductions of thousands of dollars on many different operations through the use of Kennametal tooling. But there is a much better way to demonstrate. That's in your shop, on your job. Ask us to do it.

KENNAMETAL Inc., Latrobe, Pa.
MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY



such a dumb play, he should pass it off by giving the offender a sound reprimand. Losing the diamond by wrong use is no greater crime than breaking a tap. Instead of an employer, or his trusted henchmen who particularly looks after his interests, thinking in terms of the financial loss incurred by lost diamonds, let him dwell upon another jewel in his possession, the faithfulness and good will of the workers on whom his successful business is based.

Sam Hill
Denver, Colo.

•

REGARDLESS of recommendations, people need to associate and actually deal with one another before they really know and understand each other. Therefore when a new employee starts work, however well he may have been recommended, the foreman should start him on work where the risk of spoilage is not great, then gradually give him work requiring better judgment and greater skill.

The amount of risk that people are willing and feel safe in taking, runs to extremes, from the greatest to a timidity that holds them to a speed that places them at a pace too slow for profit.

Most people have a weak spot somewhere which Ed calls a dumb streak.

While the incident mentioned was certainly a case of poor judgment and was also a case where the operator was given the job before his capacity was fully known.

Even after an operator becomes acclimated to his surroundings sometimes an unaccountable action occurs of which the one cited seems to be typical, as it looks like a case where the foreman and operator each should share a portion of the blame.

Abel Blakeman
Watervliet, N. Y.

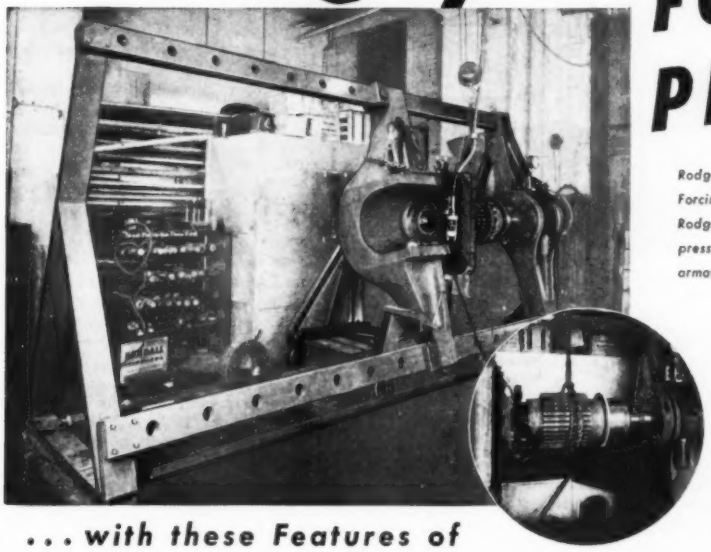
•

CONCERNING the "Lost Diamond Mystery" it would not appear reasonable to ask Michner to pay.

If people in supervision or management take action which results in a loss to the company either in dollars, customer good will, or general prestige, they are not expected to make financial restitution to the company. Unless there is strong evidence to the contrary, it is considered that they made an honest mistake. It does become a part of the individual's record, either written or

For Fast, Efficient Pressing Bending, Forming, Straightening...

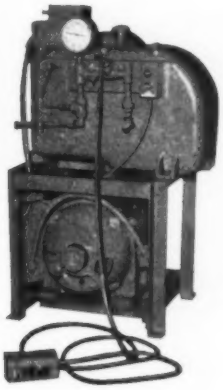
New Rodgers FORCING PRESSES



Rodgers 300 Ton, 75° Inclined, Stationary Forcing Press, one of many in the complete Rodgers line. In the application shown, the press is being used efficiently to press an armature shaft.

. . . with these Features of Construction and Operation

- **SEPARATE PUMPING UNITS**—Choose from individual hand-operated or power-driven pumps to operate any model Rodgers Forcing Press.
- **REMOTE CONTROL OF POWER PUMPS**—Operator can control press from any desired position.
- **REMOVABLE HYDRAULIC CYLINDER**—Cylinder is easily removed from head member to permit servicing or use for other power applications.
- **INDIVIDUAL FRAME UNITS**—Tracks, tension bars, abutment member and head member are all separate units to facilitate handling and erection of press.
- **EXPERTLY ENGINEERED AND CONSTRUCTED**—All units of Rodgers Forcing Presses are made strong, durable and dependable to give years of reliable service.



. . . Separate Power Pump

Select your press operating unit from hand-driven pumps or power-driven pumps. Shown is a Rodgers 2-cylinder Power Pump with remote control.

. . . In these Types and Sizes

Rodgers Versatile Forcing Presses are available in portable or stationary models—horizontal, vertical, 75° or 90° inclined—100 to 600 tons—with hand-operated or power-driven pumps. In this broad selection, you'll find the ideal press to meet your requirements.

Send for New Catalog...

For full details and specifications on the complete line of Rodgers Forcing Presses send for Catalog 315.

HYDRAULICS Rodgers THE WORLD MOVES

Rodgers Hydraulic, Inc.

7407 WALKER ST., ST. LOUIS PARK, MINNEAPOLIS 16, MINN.

HYDRAULIC POWER EQUIPMENT

STEP RIGHT UP AND GET YOUR PRINTS ON TIME*
*Today's Bruning "93" can make up to 105 square feet of black-and-white prints per minute.
SPEED TO SPARE!
EASY OPERATION!
EMITS NO FUMES!

Outgrown your present black-and-white print equipment? Meet today's Bruning—it makes other machines look slightly horse-and-buggy. It's the talk of the trade!

TALK ABOUT VOLUME...with a Model 93 Bruning you can print up to 105 square feet per minute! And that's *finished* prints—prints that come out flat, dry, neatly stacked, and ready for immediate use.

TALK ABOUT EASY OPERATION... since Bruning BW machines *use no vapors and emit no fumes*, they require no special exhaust installation. You merely connect them to your electrical circuit and you're ready to make prints. And when a Bruning machine is rolling, all you do is set the desired speed and feed in the paper. That's all. No trained operator is needed.

TALK ABOUT EASY MAINTENANCE...all essential bearings are permanently lubricated—also self-aligning. The adjustable speed drive is a patented, stepless transmission that runs for years without attention. Parts that do require occasional attention are accessible in minutes.

TALK ABOUT FLEXIBILITY... Bruning BW machines can handle *any* black-and-white print jobs, and six different models offer a complete range of speeds and capacities. Too, there are 83 varieties of Bruning sensitized papers, films and cloths—far more than any other manufacturer offers.

SEE FOR YOURSELF the speed and ease of operating a Bruning BW machine. It's an eye-opener even if your present equipment is just a few years old. A complimentary demonstration, or our explanatory booklet, is yours for clipping the coupon.

The revolutionary, new BW Copyflex model.

BRUNING

Specialists in copying since 1897

CHARLES BRUNING COMPANY, INC.
Dept. A-91 100 Reade St. New York 13, N. Y.
☐ Please send me your free booklet A-1053A.
☐ I would like to see a Bruning BW machine demonstrated.
Name _____ Title _____
Company _____
Street _____
City _____ Zone _____ State _____

unwritten. People are jealous of their own good name in all walks of life, and they will do their best to guard it. If too many errors are made, reassignment to a less demanding job would be in order if retraining is not possible.

It would seem that this is an excellent way to develop in the individual worker a sense of responsibility for maintaining his reputation as an efficient dependable worker.

Perhaps in this case, the supervisor, Ed, has some responsibility in reviewing proper procedures with his men from time to time.

F. G. Kirkham
Rochester, N. Y.

•

IT IS my opinion that no employee should pay for any damage he does while he is performing his work—be that damage caused by carelessness, thoughtlessness, or deliberate intention. In the present situation, brought about by Mitchner's folly, there may have been an oversight on his part in using the wrong tool, however, credit must be given the man for trying to get his job done.

Often the pressure brought to bear by an over-anxious foreman will result in a worker taking unnecessary risks in order to conform with the wishes of his foreman to get the work out. Playing the part of a human bulldozer conduces to the worker's lack of sound judgment at times

A foreman sticks his noodle-stem out unnecessarily when he rides one of his men unduly and should shoulder any blame for what may happen. Granted that Mitchner did not think at all when he grabbed up the diamond dresser to true a wheel entirely unsuitable for such a delicate tool. He should be given a private dressing-down—He should be given this "skinning" to improve future judgment. Perhaps he can impress him forcibly with the necessity of always using his short-circuited brains on any subsequent work.

It would be too costly to discharge a man for such a trick, however, one is inclined to lose confidence in the man who may chuck a ten-pound spur gear out of the window without first determining if the coast is clear below. I'm very much afraid of financial rectifications. I fear that such a practice would result in resentment on the worker's part which would eventually accrue in untold proportions to the detriment of both parties. Success in making right for the diamond loss will un-

Century 1 TO 400 H.P. MOTORS

Choose From These Many Types To Fit Your Job

DEPENDABLE CONSTRUCTION . . . Plus

PROPER SELECTION MINIMIZE SHUTDOWNS

Century Electric Company is celebrating its 50th year in the electrical industry.

It's easy to select the proper electric motor for your job from Century's complete line — from 1/6 to 400 horsepower. A wide range of types and kinds are available to satisfy all popular requirements. They are carefully designed, built and tested to assure maximum performance throughout their long life.

Here are examples of Century's line of INTEGRAL HORSEPOWER motors.

Polyphase

TYPE SC—Open Drip proof General Purpose Motor. Meets the needs of most installations where operating conditions are relatively clean and dry.

TYPE SC—Splash proof. Supplies protection where plants must be washed down. Keeps out all falling or splashing liquids—rain, snow, sleet, etc.

TYPE SC—Totally Enclosed Fan Cooled. Protects against dusts, mist, oil, fog. Inner frame protects vital parts of the motor, seals out harmful matter.

TYPE SC—Explosion proof. Protects life and property in atmospheres charged with explosive dusts or gases.

TYPE SR—Wound Rotor. Open Construction. Ideal for applications requiring low starting current with high starting torque, reversing or adjustable speed.

TYPE SR—Wound Rotor Splash proof. Same electrical characteristics as motor shown above. In addition, gives adequate protection against falling and splashing liquids.

Single Phase

TYPE RS—Repulsion Start Induction, Open Construction, Single Phase Brush Lifting Motor. Combines high starting torque with low starting current.

683

TYPE RS—Splash proof. Same advantages as open construction, plus protection against splashing and falling liquids.

TYPE CSH—Capacitor Start Induction, Single Phase Motor. Suitable when high starting torque with normal starting current is satisfactory.

TYPE CSH—Splash proof. Same advantages as motor shown above, plus protection against falling and splashing liquids.

Direct Current

TYPE DN—Direct Current Motors. Suitable for use where direct current is available, or its use desirable.

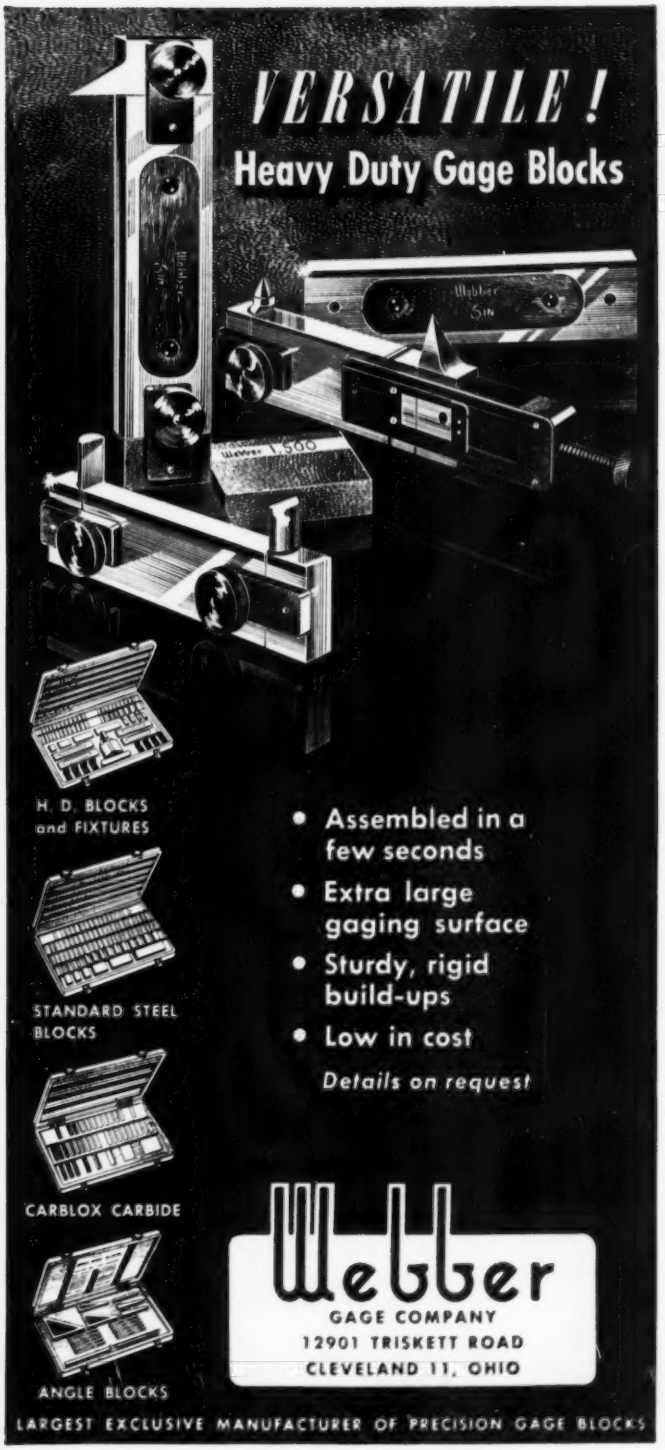
TYPE DN—Direct Current, Splash proof.

TYPE SY—Synchronous. Suitable for continuous operation at a uniform load for power factor correction.

In addition to a complete line of integral horsepower motors, Century offers fractional horsepower motors, gear motors, generators, AC and DC motor generator sets.

For a long life of satisfactory performance, specify Century motors for all your electric power requirements.

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri • Offices and Stock Points in Principal Cities



doubtedly lead to the employer expecting to be reimbursed for any costs resulting from spoiled work. An employer takes a certain amount of risk when he hires a man. It is to be expected that no one is absolutely perfect, and allowances should be made for a slip-up now and then and charge it up to loss. The profit side of the ledger will take care of itself if the employer will use broadness of vision in his conception of what is right and wrong. This will carry him through the distressing valleys that so often beset his pathway.

Jack Everett
San Francisco, Calif.

•

TEA FOR TWO

THE WRITER having worked the greater part of his life in and about various machine shops as helper, journeyman, toolmaker, foreman and at engineering work, has yet to find a shop where time was not taken off for snacks or a smoke. This time, prior to the present "break", was usually taken on the sly.

Such action on the part of employees could not be taken without an accompanying nervous strain both while in planning and for execution of the act.

No one could tell in advance when an opportunity would come for this respite, consequently an operator's mind was sometimes more attentive to the time that he could leave his work than it was on watching his job.

The present day pace is much faster than formerly and seems to be still advancing, thus making us all more anxious for a more frequent change in our task.

I believe the short snack and rest period is a desirable thing and that it very much improves working conditions in our shops today.

H. B. Martin
Waterliet, N. Y.

•

IN OUR PLANT, there's a coffee time that serves a useful and satisfying purpose. Of course, to some of the hide-bound foremen, coffee time carries the same connotation as "tea for two," and has no place in a machine shop.

Personnel directors and plant management have in most instances put the stamp of approval on coffee time as a big plus for labor and a big plus for management. For labor, it helps keep the workers fit and on their toes. For management, by

More Scrap! More Steel!!

AMERICA expects the steel industry to produce more steel this year. More steel requires additional scrap. Steelmakers need the help of all steel users to get every possible extra pound of scrap to meet the nation's call for more steel production. We urge you to do your part. Turn in your scrap through your regular channels.

YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

General Offices—Youngstown 1, Ohio
Export Offices—500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

For repetitive cutting . . .

THIS COMBINATION SAVES TIME AND MONEY

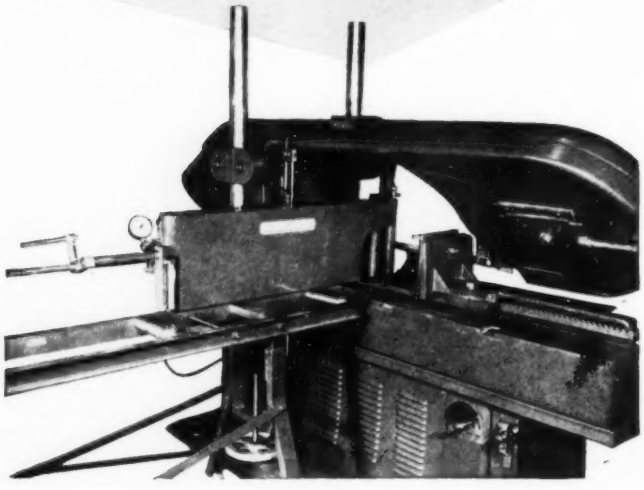
Wells No. 12 Metal Cutting Band Saw and *Wells-O-Bar* Feed Master

ANY quantity of identical lengths of bar stock are cut automatically in a Wells No. 12 Heavy Duty Metal Cutting Band Saw equipped with a Wells-O-Bar Feed Master.

In operation, the cutting head of the saw descends at a rate governed by a predetermined blade pressure setting. At the completion of each cut, the head automatically rises to a preset height and the stock is automatically projected for the next cut. The machine requires no attention except for reloading. The saw is powered by two electric motors (3/4 and 1/3 H.P.); the feed requires air at 60 to 80 psi. Capacity of the saw is 12¾" O.D. for rounds, 12" x 16" rectangular; standard feed will project up to 17".

The feed mechanism does not interfere with the use of the saw for making single cuts. Saw and feed can be purchased separately or as a combination. The feed unit can easily be attached to horizontal band saws now in service.

Ask your Wells Dealer for complete information or write direct.



Wells Saws

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

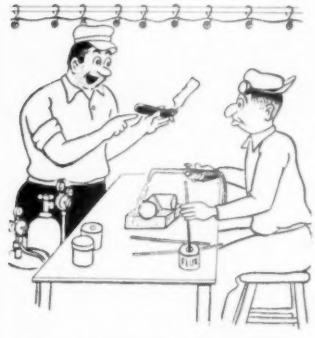
WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICH.

keeping the labor force at the peak of efficiency, it cuts down waste, absenteeism, and increases production. It adds to a plant's labor-relations program.

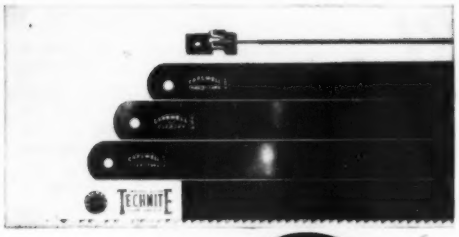
Coffee time in the plant keeps the men fit as it keeps them refreshed. It has been endorsed by leading industrial engineers as a quick energy renovation aid. In our plant, we have found that the men do not take advantage of the service to the detriment of production, but appreciate the thoughtfulness of the management in making it available.

Much modern production is repetitive, monotonous, and tiresome. This repetitive work builds up nervous tension which results in increased fatigue. Such fatigue may cause accidents, impair the worker's skill and judgment, or cause a loss in accuracy. It has been reported that in some plants most of the rejected work occurs toward midafternoon. There is also considerable evidence to show that late afternoon is the time when accidents are most frequent. So far as these factors prevail, the coffee time idea seems wholly justified. Today, industry is forced to depend more and more on inexperienced workers. They are less likely to stand up under the demands of modern industry. Many industrial relations men feel that industry can ameliorate the problems of these substandard workers by introducing two daily rest periods. But this is not wholly for the substandard employees; skilled, experienced, able-bodied workers may also need the beneficial effects of these periods.

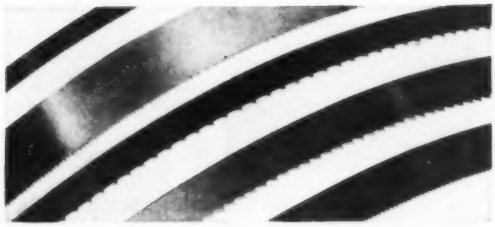
One plant handles the break thus: There are two 10-min periods each working day. Over the public-address system comes a signal to stop work. For the next 9 min employees may go to the cafeteria to drink coffee, milk, cold drinks, eat a piece



"Be a pal Joe, and hardface my razor!"



CAPEWELL



BUYERS' GUIDES for HACK SAW and BAND SAW BLADES

With the new buyers' guide bulletins now available to you, selection of the right blades for your work is made much easier. Make sure that these new bulletins are available in your purchasing department. Use the coupon below.

POWER HACK SAW BLADES: TECHNITE special alloy high speed steel; SAFETECH, a high speed blade with softer backing for safety, shatterproof. HAND HACK SAW BLADES: TECHNITE, FLEXTUNG, FLEXLOY and HARDTUNG — four types to cover every hand blade requirement, each available in two lengths, four different tooth counts.

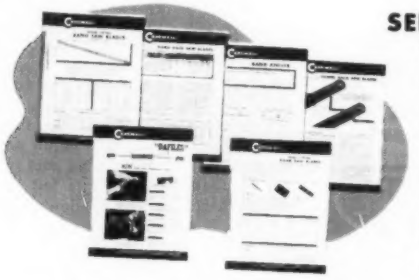
DAFILES: The all-purpose saw cuts in *any* direction . . . ideal for scroll or pattern work. Dafiles can be used in standard hack saw frames or in a power cutting jig.

BAND SAW BLADES FOR METAL CUTTING: Capewell Flexible Back Hard Tooth Band Saw Blades (available in contour saws, cut-off saws, and skip tooth saws) and Capewell Spring Temper Band Saw Blades.

FOR WOOD CUTTING: Capewell Narrow and Wide Wood Cutting Band Saw Blades.

FOR CUTTING FIBROUS MATERIALS: Capewell Band Knives, straight edge, scalloped and wavy edge types.

FOR CUTTING MEAT: Capewell Band Saw Blades and Blades for Hand Meat Saw Frames.



BUY THROUGH YOUR DISTRIBUTOR

SEND FOR THESE *NEW* BULLETINS TODAY!

THE CAPEWELL MANUFACTURING CO.
65 Governor Street, Hartford, Connecticut

Gentlemen: Please send me bulletins on
☐ Hacksaw Blades; ☐ Dafiles; ☐ Band Saw Blades; ☐ Band Knives

NAME _____

COMPANY _____

ADDRESS _____

11CAB1

MARKING TOOLS TO GIVE YOUR PRODUCT

The Mark of QUALITY!

TYPE HOLDERS AND STEEL TYPE

Parker precision press and hand marking type holders are engineered for quick, accurate interchangeability of type. Type is furnished in all standard character sizes from 3/64" to 1/4" or in special type and symbols to your specifications.

MARKING DIE FOR AZIMUTH SCALE

Sharp, clean, raised 1° increments and a double row of perfect figures, from 10 to 170 in this semi-circular azimuth scale all hardened into a solid tool steel block. Parker dies cost less because they perform perfectly—longer.

STANDARD OR SPECIAL STAMPS

Parker steel trade mark, identification, part number of inspection stamps are made in dozens of standard shapes and designs. Special stamps in any quantity, any size to mark any material are also manufactured to your specifications.

REMOVABLE INSERT MARKING DIES

This removable segment die is used for stamping and codeing military shell cases. Here one die replaces three used previously and eliminates two stamping operations, thereby decreasing marking cost by over 60%. Another application of Parker experience and craftsmanship.

HOT STAMPING DIES FOR PLASTICS

Dies like this for hot stamping plastics or wood are being manufactured continually by Parker. The most elaborate customer specifications are quickly and expertly transferred from blue print to fine tool steel and expertly heat treated and finished for longer life.

SEND FOR THE PARKER BLUE BOOK TODAY!

Marking Dies, Marking Machinery, Tracer Controlled Machining, Keller Machining, Two and Three Dimensional Engraving, Hobs and Hobbing and Special Machining.

INVESTIGATE THE FLEXIBILITY OF PARKER'S FACILITIES TODAY!

THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

of candy or smoke. Snack stands stands circulate through the factory. After 9 min, another signal sounds. And a minute later every worker must be at his post. This plant has built up a healthy respect for discipline and the periods are observed with almost military precision. The company feels that these periods are beneficial. They are convinced that these periods are one factor in the company's high production record.

Of course there are stumbling blocks to the "coffee time" periods. Generous periods in some plants have been abused. Some executives report that periods originally intended for 10 min soon become 15- or 20-min periods. It is necessary to discipline these periods and police them to some extent. Much, if not all of the benefits disappear when a period for a short rest and some quick energy food degenerates into a loafing spell, or a time for horseplay, beefing, complaining, or idleness.

Though these periods do not result in the scientific elimination of fatigue they do offer a condition which is similar in effect to that of the noon hour. In cases where production falls immediately before the noon hour and in the late afternoon, or where accidents seem to be greater at these times, it will be found usually that such refreshment periods will even up the curve of production, and reduce accidents throughout the day without a loss of total output.

Harry Kaufman
Philadelphia, Pa.

•

FROM ALL DATA available, the daily lift is necessary. It does seem odd that our human race has developed the need to eat five times a day. Yet this seems the modern trend.

For many years this country was able to efficiently operate business without the stoppage of ten minutes in the morning and ten minutes in the afternoon. We are told, however, that we can get more out of our workers if we give them these privileges. Now this may be true in theory, but I wonder sometimes about the actual facts. . . . facts that are collected not as test cases. From observation which I will admit does not have the substantiating cold production data needed, it is felt that much more than the allowed ten minutes is consumed. We find that the employees are mentally waiting for the period five to ten minutes before the actual time arrives and

(*Continued on p. 234*)

subcontracting NEWS

Typical of procurement facilities now made available to small business is the setup at the New York regional office of Eastern Air Procurement District, 67 Broad St. Shown studying contract specifications with potential subcontractors are Aaron Kaplan (left) and Robert Clark (third from left), small business specialists; and Capt. D. C. Cady, chief, Small Business Office (second from right). In background is bulletin board on which are posted daily the Invitations to Bid, as described in story below

New Air Force Procurement Policy To Aid Smaller Manufacturer

DAYTON, Ohio—Complete information on all proposed Air Force unclassified procurement in excess of $10,000 is now available in regional offices of the Air Materiel Command. The new policy involves a modification of the negotiated contracts setup to allow smaller firms to bid on items previously handled by direct contact with command headquarters and to establish themselves as AF prime contractors.

In addition to negotiated as well as advertised bids, small manufacturers will have access to procurement requests of all the AF installations in the US. Previously the base limited distribution of the necessary information to the immediate region.

• **Bid rooms** in each regional office will list all negotiated bids, as well as those advertised. Each proposed negotiated procurement will have complete data, drawings, and specifications for examination by interested potential contractors. At the local AF Small Business Office, specialists in the small business field will supply additional information and assistance in servicing contracts. These specialists will also assist in obtaining subcontracts with AF prime contractors. Bids can be submitted on company letterhead through AF regional offices. If the bid is accepted the office will survey his facilities.

Items requested on Request for Proposal (RFP's) in most cases are not standard items. They may involve development, research, or initial procurement on a research and development project just completed.

Invitations for Bid will usually be given advance notice through the local offices prior to the general release date. After release, 20 or 30 days is usually given for bids to be submitted.

• Invitations to be released in the near future are listed here. Further details can be obtained from local AF Small Business Offices:

IFB 33-600-52-157 (3 items)
Buffer and Polisher, pedestal type, 2 wheel, variable-speed ac motor, 5 hp, 220/440 v, 3 phase, 60 cycle. Spec. MIL-B-4048 (USAF). Complete with adjustable hood, 2 buffing wheels, and 2 polishing wheels.

Grinder and Buffer, pedestal type V, 2 wheel, 8-in. dia grinding wheel, and 10-in. dia wire wheel, motor ½ hp min, ac 220/440 v, 3 phase, 60 cycle, Fed. spec. W-G-556A. Wire wheel in accordance with spec. 50242-B.

Grinder and Buffer combination, pedestal, ac motor, 220/440 v, 3 phase, 60 cycle. Grinding wheel and wire buffer wheel 10-in. dia type V. Fed. spec. W-G656A. Complete with 2 medium coarse, 2 fine silicon carbide wheels, and 2 wire buffing wheels.

IFB 33-600-52-158
Trailer, servicing, utility aircraft maintenance, 3 wheel, 2000 lb capacity, type K-1. Spec. 30-171A.

IFB 33-600-52-173
Bar assembly, airplane nose wheel, towing. USAF dwg. 43J7726, 42J463, and 51D7375.

IFB 33-600-52-156
Tripod folding, triangle, SC dwg. B-24289. Also parts, including tripod head assembly.

IFB 33-600-62-160 (128 items)
Bolts, all types (carriage, chain, hex-head, sq head, and round head). 128 items in various quantities from 500 to 448,000 each.

1500 Subcontractors Help Make Tanks

SCHENECTADY, N. Y.—The Army's newest medium tank—the improved General Patton—is now rolling off assembly lines at the American Locomotive Co. plant here, first of the new model to be produced by a private company. The Army's Detroit Arsenal also has turned out the new model recently.

American Locomotive said that more than 1500 subcontractors are producing parts for the new tank, some of them small companies with fewer than 300 workers.

Subcontractor Exhibits Scheduled

WASHINGTON—To enable small businessmen to examine military items which they might make under subcontract, exhibits are being organized by the Armed Forces Regional Councils under supervision of the Munitions Board, as follows: Los Angeles, Sept. 18-21; Detroit, Oct. 30-Nov. 2.

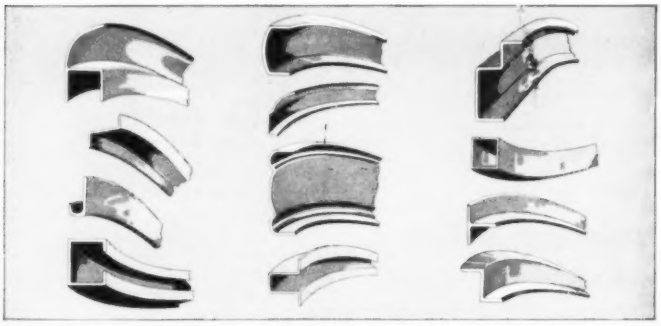
To Recondition Aircraft

DALLAS, Tex.—A new contract for cycle reconditioning of C-54 aircraft has been awarded to Texas Engineer- & Mfg. Co., Inc., here by Air Materiel Command. Work will be performed at Greenville, Tex.

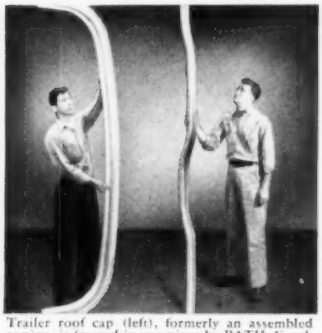
PRODUCTION OF CURVED METAL PARTS

- ✓ Jet Engines
- ✓ Air Frame Sections
- ✓ Airplane Skin Sections
- ✓ Airfoil Sections
- ✓ Engine Containers
- ✓ Helicopter Frames

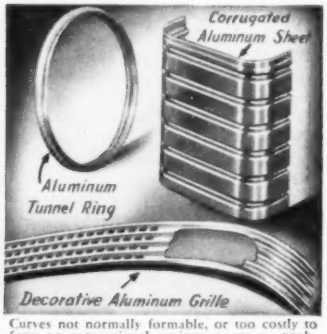
Our Custom Forming Division serves metal working industries by bending and fabricating—from many cross sections, whether extrusion, rolled, bar, strip or sheet—in any metal, whether aluminum, carbon, alloy steel, stainless or bronze—to most any curve, whether shallow or sharp, constant or compound. Send blueprints and production requirements for prompt quotation.



A few of the cross sections curved and bent by BATH Metal Form Division.



Trailer roof cap (left), formerly an assembled section, is formed in one piece by BATH. Coach frame (right) includes reverse bends.



Curves not normally formable, or too costly to form on conventional equipment, are no problem for the BATH method.

The CYRIL BATH Co.

Established in 1915

6910 MACHINERY AVE. • CLEVELAND 3, OHIO

10 YEARS SERVICE ON CONTOUR FORMING . . .
. . . TO THE METAL WORKING INDUSTRIES

Air Force Saves $2½ Million Yearly in Contractors' Discounts

DAYTON, Ohio—opening of seven branch disbursing offices close to American industry is helping to save the Air Force $2½ million a year in contractors' discounts, Air Materiel Command has disclosed.

The disbursing offices are located at Los Angeles, Ft. Worth, New York, Detroit, Chicago, Boston and Seattle.

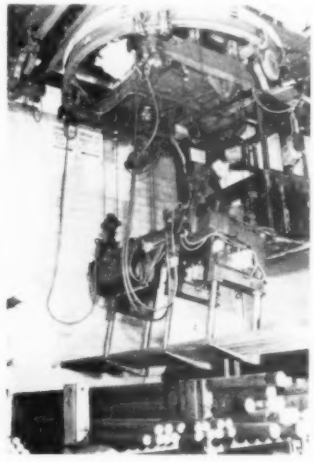
AMC's program of decentralizing its disbursing points, coupled with a more determined approach to capitalizing on discounts, has led the Air Force to cash in on more than 96% of total discounts offered.

Before the new arrangement, contractors offered fewer discounts because of frequent delays in contract payments.

American Stove Co. to Make Fuel Tanks For B-47 Program

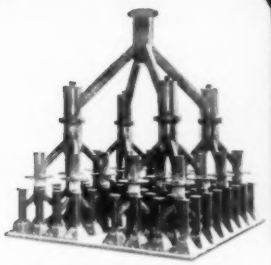
ST. LOUIS—American Stove Co., makers of Magic Chef gas ranges, will start production soon on large fuel tanks for three major aircraft firms manufacturing the B-47 "superjet" bomber.

A contract involving Boeing, Douglas, and Lockheed has been negotiated and tentative schedules agreed upon. The tank is one of the largest of its kind and requires advanced methods of fabrication.



SPECIALLY-BUILT 3-ton capacity, double-bridge, monorail crane handles 4.5-million lb of bar stock annually in General Electric's Small & Medium Motor Div., Lynn, Mass. Main element is the grab, a steel frame suspended by pulley and cable, equipped with three movable forks and safety prongs

Steel-Weld FABRICATION

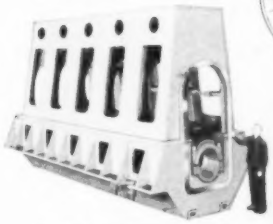


One of Several Parts of a Catalytic Cracking Plant Produced for the Petroleum Industry.

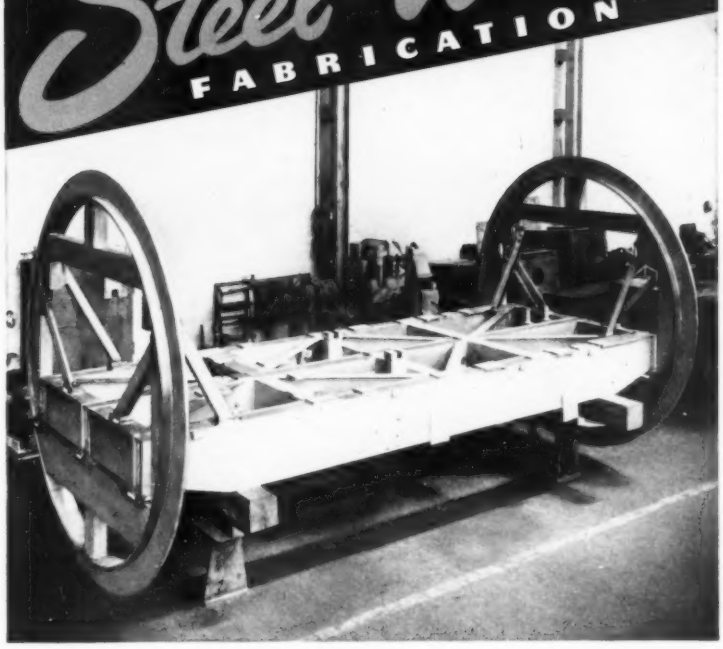
Pressure Vessels for the Chemical and Allied Industries.

Heavy Press and Machine Frames and Bases for the Machine Tool Industry.

Diesel Engine Crank Cases and Frames for the Marine and Electro-Motive Field.



Crank Cases, Frames, and other Parts for Manufacturers of Marine Steam Engines of Uniflow or Multiple Expansion Type.



Use WELDED STEEL for Greater Strength with Less Weight!

The Steel-Weld Fabricated Roll-Over Fixture illustrated above, with end frames eleven feet in diameter, is another excellent example of a unit which could not be economically produced by any other method . . . it is typical of thousands of heavy machinery parts and assemblies produced by Mahon for many manufacturers. If savings in either time or cost can be effected in your operations through Steel-Weld Fabrication of parts or fixtures, or if you are cramped for manufacturing space, it will pay you to investigate Mahon facilities. You will find an unique source with complete, modern fabricating and machining facilities for any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures you a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

4 BIG REASONS

Why LYON Can Handle Your Sheet-Metal Subcontracts BETTER!

LYON METAL PRODUCTS, INCORPORATED
989 Monroe Avenue, Aurora, Illinois

Please send me a copy of LYON'S DEFENSE PRODUCTION BROCHURE which explains the 4 big reasons why Lyon can handle sheet metal subcontracts better.

NAME _____ TITLE _____

COMPANY _____

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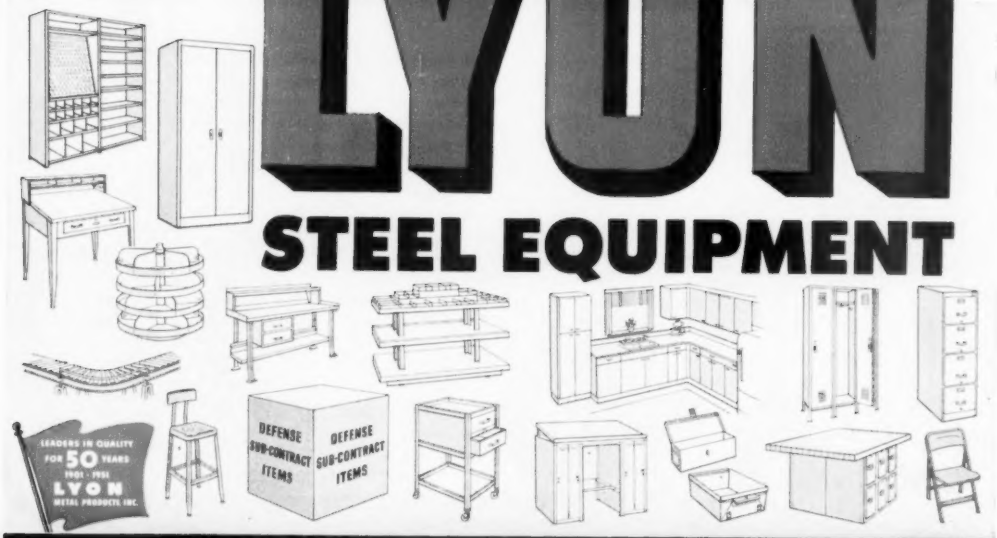
MAIL COUPON FOR THIS BROCHURE • IT TELLS ALL

2 STRATEGIC PLANTS . . . AURORA, ILL., AND YORK, PA.

LYON METAL PRODUCTS, INCORPORATED

General Offices: 989 Monroe Avenue, Aurora, Illinois

LYON STEEL EQUIPMENT


LEADERS IN QUALITY FOR 50 YEARS 1901 - 1951 LYON METAL PRODUCTS, INC.
DEFENSE SUB-CONTRACT ITEMS
DEFENSE SUB-CONTRACT ITEMS

A PARTIAL LIST OF LYON STANDARD PRODUCTS

- Shelving
- Lockers
- Stools
- Bin Units
- Kitchen Cabinets
- Cabinet Benches
- Storage Cabinets
- Welding Benches
- Conveyors
- Bar Racks
- Tool Boxes
- Parts Cases
- Economy Locker Racks
- Flat Drawer Files
- Tool Room Equipment
- Wood Working Benches
- Display Equipment
- Drawing Tables
- Revolving Bins
- Hanging Cabinets
- Filing Cabinets
- Folding Chairs
- Work Benches
- Bench Drawers
- Service Carts
- Sorting Files
- Drawer Units
- Hopper Bins
- Tool Stands
- Shop Boxes
- Tool Trays
- Shop Desks

Walker Bulldog tank negotiates tough going in heavy mud at the Cadillac Ordnance Proving Ground at West Richfield, Ohio. Gun in this picture is shown locked in position on the rear of the vehicle in the traveling position. The Cadillac Proving Ground is operated as part of an extensive research program on experimental and production models of combat vehicles

Navy Contractors List Small Business Opportunities

WASHINGTON—Navy procurement offices are continuing their listing of short supply items required by prime contractors to meet production schedules. Manufacturers with proper facilities can contact the listed contractor for possible subcontract work. Further information can be obtained from the nearest office of the Navy Material Inspection Service.

Subcontractor opportunities with Navy contractors are listed here with the prime contractor named first, followed by the subcontract item in short supply. Specifications are given where available:

Electronic & Electrical Items

Birmingham Foundry, Birmingham, Ala.—motors, ½ hp, 1800 rpm, explosion proof, 220/440 v, 60 cycle.

Western Electric Co., Winston-Salem, N. C.—circuit breaker; generator; Switch, 1, spec. JAN-S-23F; relays; and timer.

Spencer - Kennedy, Cambridge, Mass.—ganged potentiometers for variable frequency filter.

Tracer Laboratories, Boston, Mass.—photo-multiplier tubes.

General Communications, Boston, Mass.—invar steel relays, pulse transformers.

National Co., Malden, Mass.—terminals, transformers.

Marion Electrical Instrument Co., Manchester, N. H.—meter rectifier.

Northeastern Engineering, Manchester, N. H.—transformers, meters.

Tobe Deutschman, Norwood, Mass.—transformers.

Raytheon Mfg. Co.—Waltham, Mass.—potentiometers, transformer cores.

Ripley Co., Middletown, Conn.—potentiometers, switches, receptacles, transformers, and relays.

Modine Co., Racine, Wis.—fractional and small hp motors.

Kwik Mix Co., Port Washington, Wis.—motors.

Allis-Chalmers Mfg. Co., West Allis Wis.—starter switches, all types.

Arkay Supply Co., Rochester, Minn.—motor, 1/50 hp, split phase ac, induction.

Branham, Mareck & Duepner, Inc., Minneapolis, Minn.—lampholders.

Minneapolis Honeywell Regulator Co., S. Minneapolis, Minn.—special multipliers, variable resistors.

National Heater Co., St. Paul, Minn.—magnetic switches, limit switches, oil burner relays, thermostats.

White Mfg. Co., St. Paul, Minn.—switches, Cutler-Hammer.

Vickers Electric Div., St. Louis, Mo.—rheostats, and switches.

Vulcan Iron Works, Denver, Colo.—meters, electric.

Vendo Co., Kansas City, Mo.—toggle switches.

LeLand Electric Co., Dayton, Ohio—carbon brushes ⅜ in. long, 7/32-in. wide.

Television Associates, Michigan City, Ind. — electronic materials, transformers, and capacitors.

South Bend Lathe Works, South Bend, Ind.—motor controls and motors.

U. S. Slicing Machine Co., La Porte, Ind.—control boxes.

Orton Crane & Shovel Co., Huntington, Ind.—starters.

Magnavox Co., Fort Wayne, Ind.—switches.

Stewart & Stevenson Services, Inc., Houston, Texas—generators.

Librascope Inc., Glendale, Calif.—rotary switches, and milli-ammeters, spec. AN-58N-468.

Bell Aircraft Co., Buffalo, N. Y.—dc-timing motors.

Link Aviation Inc., Binghamton, N. Y.—potentiometers.

General Electric Co., Syracuse, N. Y.—connectors, AN-3102, AN-3106, AN-3108, MIL-C-5015 toggle switch, JAN-S-23; sensitive switch, JAN-S-63; rotating switches; magnetron tubes, JAN 1A wire and cable, JAN-C-76; transformers, particularly oil filled, JAN-T-27 or MIL-T-27.

National Electric Machine Shop, Inc., Silver Spring, Md.—toggle switches, JAN-S-23.

Baldwin-Lima-Hamilton Corp., Eddystone, Pa.—pushbutton assemblies, Navy 9-S-4838L toggle switches, AN-S-20, terminal lugs, spec. 47-C-2.

Champion Blower & Forge Co., Lancaster, Pa.—¾ to 3-hp motors, BuShips spec. 17F8; controllers, BuShips spec. 17F8.

Macbeth Lamp Co., Philadelphia, Pa.—dc timers, calibrated in minutes and seconds.

Aldrich Pump Co., Allentown, Pa. motors and controllers, all sizes.

Packard's J-47 Engine Program To Use Weatherhead Company

CLEVELAND — The Weatherhead Co. has received a subcontract from the Packard Motor Car Co. in connection with production by Packard of a new version of the J-47 turbojet engine.

The J-47, which Packard is to build as a prime contractor with the US Air Force under a licensing agreement with the General Electric Co., has been allocated for the Boeing B-47, fast medium bomber.

Dollar volume and other details were not divulged.

Latest Defense Contracts

ARMY ORDNANCE AWARDS

American Locomotive Co., Schenectady, N.Y.—tanks, M-47 medium, spare parts (exceeds $250,000).

American Generator & Armature Co., Chicago—replenishment of tank and combat vehicle parts (exceeds $250,000).

Gar Wood Industries, Wayne, Mich.—tank, automotive, spare parts.

Standard Steel Works Div., Baldwin-Lima-Hamilton Corp., Burnham, Pa.—breech ring forgings for 155mm gun T80, $129,137.

Electric Eye Equipment Co., Danville, Ill.—photo gaging machines.

General Electric Co., Chicago—induction heat units.

Ithaca Gun Co., Ithaca, N. Y.—rifle, shotgun, survival, cal .22/410, M6 (exceeds $250,000).

SIGNAL CORPS AWARDS

(Dollar value not furnished)

John R. Hollingsworth Corp., Clifton Heights, Pa.—power units, maintenance parts.

Kohler Co., Kohler, Wis.—power unit, maintenance parts.

Jacobsen Mfg. Co., Racine, Wis.—generator, maintenance parts.

Chicago Transformer, Chicago—coils, transformers and reactors.

Alma Trailer Co., Alma, Mich.—shelter, maintenance parts.

Electric Products Co., Cleveland—motor, generator.

Barker & Williamson, Upper Darby, Pa.—radio sets.

Alliance Mfg. Co., Alliance, Ohio—power unit, maintenance parts.

S. H. Couch Co., Inc., North Quincy, Mass.—remote control equipment.

United States Motors Corp., Oshkosh, Wis.—power unit.

Motoresearch Co., Racine, Wis.—Maintenance parts for power unit.

Twain Tool & Mfg. Co., Chicago—coupling unit antenna.

Witte Engine Works, Kansas City, Mo.—engine parts.

Penn Boiler & Burner Mfg. Co., Lancaster, Pa.—power unit.

Whitehead & Co., Los Angeles—laminating machines.

Admiral Corp., Chicago—radio set.

Radiomarine Corp. of America, New York—radio transmitter.

Raytheon Mfg. Co., Waltham, Mass.—channel alignment kits.

FADA Radio Corp., Belleville, N.J.—power supply.

Gray Mfg. Co., Hartford, Conn.—amplifier.

Electro-Engineering Products Co., Chicago—motor generators.

North Electric Mfg. Co., Galion, Ohio—all relay dial system.

Muter Co., Chicago—coils.

Telectro Industries Corp., Long Island City, N.Y.—auxiliary interphone equipment.

Kelly-Koett Instrument Co., Cincinnati—radiac meter.

General Electric Co., Philadelphia—ceilometer.

Radio Television Corp., New Brunswick, N.J.—control box.

Triumph Mfg. Co., Chicago—test equipment.

Munston Mfg. & Service, Inc., Islip, L.I., N.Y.—test equipment.

NAVY AWARDS

J. M. Martinac Shipbuilding Corp., Tacoma, Wash.—minesweepers.

Newport News Shipbuilding & Drydock Co., Newport News, Va.—construction of CVB.

Arma Corp., Brooklyn, N.Y.—spare parts, components, etc., for repairs, overhaul, alteration & maintenance of fire control equipment, $100,000.

Eaton Metal Products Co., Denver, Colo.—spherical floats (exceeds $250,000).

Robertshaw-Fulton Controls Co., Greensburg, Pa.—synchros 400 cycle (exceeds $250,000).

The Sharples Corp., Philadelphia—repair parts for lube and fuel oil purifiers, $220,449.

Gar Wood Industries, Inc., Findlay, Ohio—ditchers, wheel type, crawler mounted, $200,000.

Universal Engineering Corp., Cedar Rapids, Iowa—crushing and screening plant with spare parts, $241,859.

J. D. Adams Mfg. Co., Indianapolis—road grader (exceeds $250,000).

Friez Instrument Div., Bendix Aviation Corp., Baltimore—radiosonde, transmitter, $126,130.

Federal Explosive Inc., New York—sets of booster assemblies (exceeds $250,000).

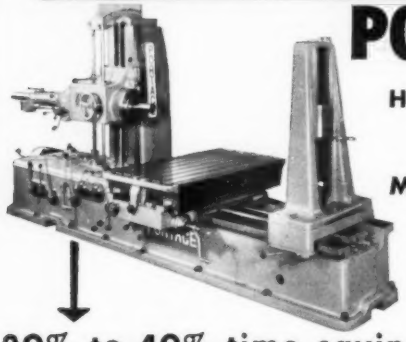
West Bend Aluminum Co., West Bend, Wis.—2.75-in. rocket containers, Mark 1 (exceeds $250,000).

National Steel Construction Co., Seattle—spherical floats.

Amphibious Ship Contract Won

SAN JOSE, Calif.—Food Machinery & Chemical Corp. has received a US Navy contract for production of an undisclosed number of new amphibious type ships. The vehicles will be built at the company's packing equipment plant, Riverside, Calif.

QUICKER TOOL CHANGE with PORTAGE



HORIZONTAL BORING, MILLING and DRILLING MACHINE No. 4

20% to 40% time saving

PORTAGE machines are preferred by many because you can make quicker tool change and save 20% to 40% in time. Others prefer PORTAGE because of its superior construction that prevents deflection.

Large, easy-reading dials in thousandths of an inch. All controls in front. Power rapid traverse. Automatic feeds. Working surface 36" x 72" and 60" cross travel. Write for new catalog.

THE PORTAGE MACHINE COMPANY

1026 SWEITZER AVENUE (Est. in 1916) AKRON, OHIO

PLANT FACILITIES OPEN TIME AVAILABLE on INTERNAL and EXTERNAL THREAD GRINDING

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MACHINERY BUILDERS, INC.

475 GRAND CONCOURSE

BRONX, NEW YORK

how to get small DEFENSE parts in a HURRY...without prefabricated metal WORRIES

design it as a GRC ZINC DIE CASTING!

COMPARE:

COMPARE! Parts made by old methods:		COMPARE! GRC Improvements:
	SPRING WASHER Formerly stamped; die casting permitted design improvement.	
	CUP GEAR Originally a 3-piece assembly—stamping, screw machine & wire form.	
	PUNCTURING PIN. Was aluminum screw machine part.	

- GRC goes right to work from your prints
- GRC avoids delays—no waiting for prefabricated materials
- GRC helps you meet delivery schedules
- GRC cuts costs—avoids scrap loss

When it comes to turning out *really small* parts speedily and economically—Gries has a wealth of experience in meeting both civilian and military requirements. Gries' exclusive production facilities make simple or intricate parts in 1 automatic operation—completely trimmed, ready for use, from 100,000 pieces to many millions.

***TODAY**—Find out how GRC can help YOU! Write, wire, phone for bulletin, samples. Or send your prints for quotations and delivery dates.*

GRC

Max. Wt.—$\frac{1}{2}$ oz.
Max. Lgth.—$1\frac{3}{4}$"
SMALLNESS UNLIMITED

GRIES REPRODUCER CORP. 112 Willow Ave., New York 54 • Mott Haven 9-2476

Can any of these free services help you speed defense production?

New York State offers these aids to defense manufacturers and suppliers

1. Help in Locating Subcontractors. The New York State Department of Commerce, through its "Industrial Preparedness Survey," can supply complete data on plants and equipment suitable for production of specific defense items. A prime contractor can speedily locate the subcontractor he needs.

2. New Plant Site Location. To help you establish new plants or expand current operations, the Department will be glad to recommend appropriate locations available within the State. Information on labor, raw materials, power, water, fuel and transportation will aid your decision. Inspection trips are arranged confidentially.

3. Office in Washington. A New York State office is maintained in the nation's capital to help New York businessmen. This office sets up meetings with the proper personnel; provides information on government agencies; keeps abreast of current regulations and restrictions; aids in preparing applications and other papers needed to carry on business with Federal agencies.

4. Information on Current Federal Purchasing. As part of its service to businessmen, New York State screens notices of Federal procurement opportunities and circulates procurement information to firms within the State

Write for bulletin

New York State Department of Commerce
Room 125, 112 State St., Albany 7, N. Y.

Please send me a copy of your free bulletin "Defense Services of the New York State Department of Commerce."

*Name*_____

*Position*_____

*Company*_____

*Street*_____

*City*_____ *State*_____

Servo-Tek Products Co., Inc., Paterson, N.J.—dc motors (exceeds $250,000).

Francis Metal Products Corp., Palmyra, N.Y.—torpedo gyro course devices, (exceeds $250,000).

Cosa Corp., New York—machines, Reishauer, tooth flank gear grinding, $203,457.

Westinghouse Electric Corp., Philadelphia—main propulsion control parts, $119,712.

Unit Crane and Shovel Corp., Milwaukee—spare parts, $130,290.

Gustin-Bacon Mfg. Co., Los Angeles—equipment, ultralite insulation, $155,357.

Wayne Mfg. Co., Pomona, Calif.—road sweeper, $171,600.

Bucyrus-Erie Co., South Milwaukee, Wis.—spare parts, $206,800.

Armco Drainage & Metal Products Inc., Calco Div., Los Angeles—ammunition storage magazines (exceeds $250,000); buildings, prefab., (exceeds $250,000).

Iowa Mfg. Co., Cedar Rapids, Iowa—spare parts (exceeds $250,000).

Unexcelled Chemical Corp., Cranbury, N.J.—igniters, Mark 114, $125,424.

Simplex Wire & Cable Co., Cambridge, Mass.—submarine mine cable and steel reels, $117,494.

McCord Corp., Detroit—rocket motors, Mark 15 (exceeds $250,000).

Kilgore Inc., Westerville, Ohio—aircraft (parachute) flares (exceeds $250,000).

Clayton & Lambert Mfg. Co., Louisville, Ky.—design and construct building for manufacture of steel cartridge cases and storage.

AIR FORCE AWARDS

Ajax Mfg. Co., Cleveland—presses (exceeds $250,000).

U.S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.—transmitters, fuel pressure synchro style (exceeds $250,000).

Lumoar Mfg. Corp., New Haven, Conn.—container assemblies, $219,200.

Bell & Howell Co., Chicago—cameras, $149,616.

Kearfott Co., Inc., Little Falls, N.Y.—aircraft compasses (exceeds $250,000).

McColpin-Christie Corp., Los Angeles, Calif.—rectifiers.

TEMCO Uses Service Clinic With Good Results

DALLAS—Texas Engineering & Manufacturing Co., Inc. has placed eleven different subcontracts, as a result of contacts made at the Armed Forces Small Business Procurement Clinic held recently in Fort Worth.

In addition, through the clinic, TEMCO has established approximately 60 firms as prospective sources capable of doing the work the company now has available for subcontract.

Most of the company's work is in building major assemblies under subcontract from the major aircraft firms, such as Boeing, Lockheed, Douglas, and Martin. In the fabrication of such assemblies TEMCO itself has found it advisable to subcontract many parts to small manufacturers.

What's in Vermont this month?

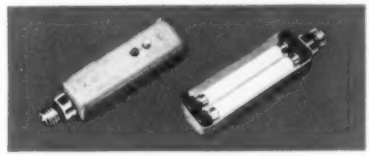
BRYANT EXPANDS ITS INDUSTRIAL INTERESTS

Bryant Chucking Grinder Company has recently purchased an interest in Stocker & Yale, Marblehead, Massachusetts. This affiliate manufactures the "Lite-Mite," a fluorescent work light for use on bench work, machine tools, sewing machines, microscopes, etc.

The "Lite-Mite" is only $6\frac{1}{4}$" long, yet contains two fluorescent tubes, reflector, switch, ballast and related control equipment. It may be installed by screwing into any conventional light socket for 115-volt, 60-cycle A.C. operation. End or side mount can be provided.

The "Lite-Mite" is up to 200° F. cooler than incandescent lamps and gives up to 500 foot-candles at 3" to 5" working distance—5 times the illumination for comparable incandescent cost. Its unusually rugged construction makes the "Lite-Mite" ideal for industrial applications.

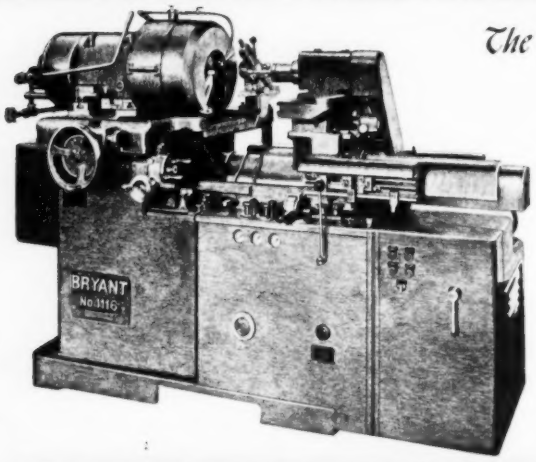
Stocker & Yale also manufactures a wide line of "Lite-Mite" fluorescent illuminated magnifiers, miniature optical projectors and optical instruments. All



products are sold through electrical distributors, specialty dealers and trained representatives. Inquiries should be addressed to Stocker & Yale, Marblehead, Massachusetts.

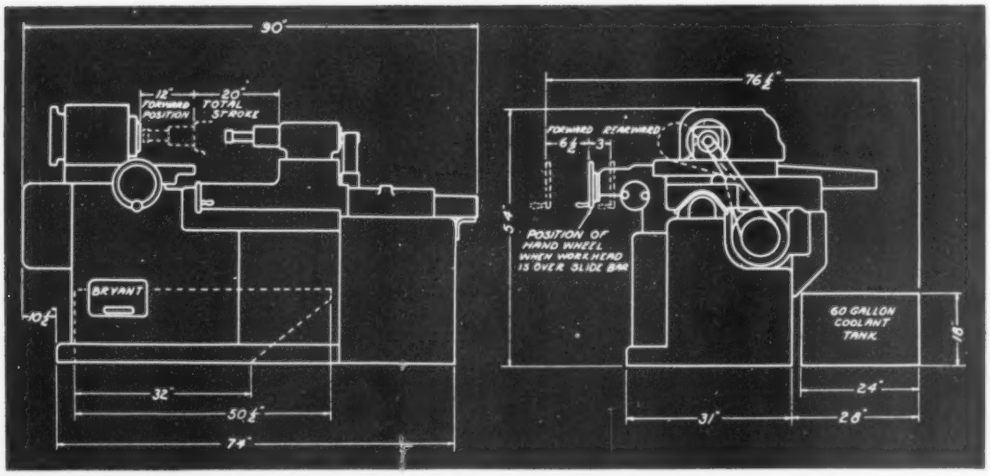
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

FOR HOLE GRINDING

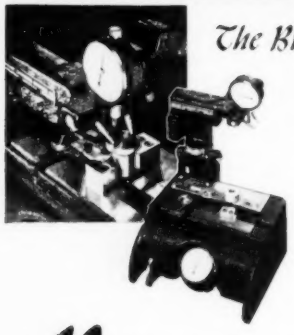


The Bryant 1116 Hydraulic Hole Grinder

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16" with 8" max. hole depth. Write for folder.



FACE SQUARE WITH INTERNAL THREAD



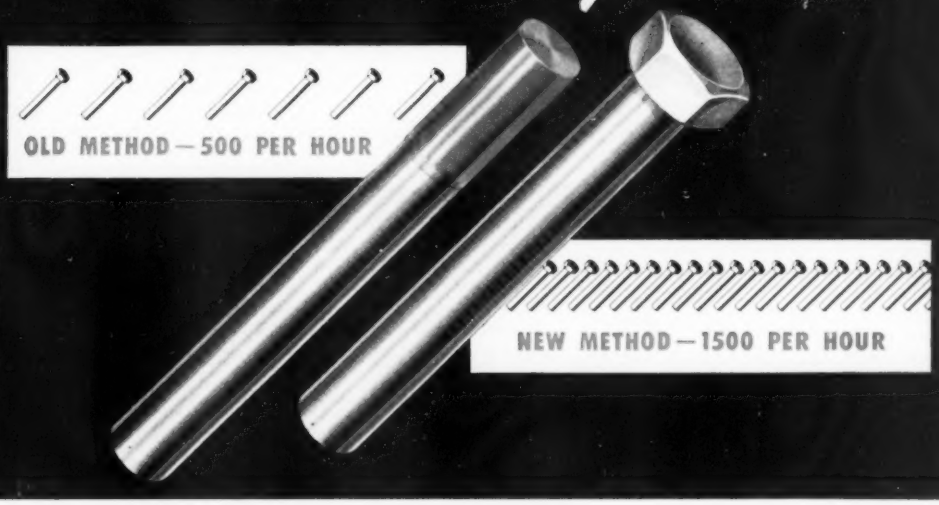
The Bryant Thread Gage with Squareness-of-Face Attachment

When a face must be checked square with an internal thread, the part should be held on the thread flank and rotated in this position. The Bryant Gage does this, regardless of variation in roundness, P.D., lead or thread form. The squareness-of-face indicator is raised by a yoke at a constant rate regardless of face run-out, thus giving a direct and exact reading of squareness with the thread axis. Simultaneous readings can be made — the Bryant Gage checks thread size — the Attachment shows face run-out.

Bryant Thread Gage gives accumulated reading of P.D., form and lead on dial indicator 4 to 5 times faster than plug gaging!

Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

PRODUCTION *Tripled!*



with TOCCO* Induction Heating

THE Northwest Bolt and Nut Co. of Seattle installed a 50 kw 10,000 cycle TOCCO machine, to replace a conventional oil-fired slot type forging furnace, for heating bolt blanks for upsetting. Production on ½" diameter stock zoomed from 500 to 1500 pieces per hour—on ⅞" stock from 250 to 600 per hour.

ADDED ADVANTAGES

1. Uniform heating for better quality—fewer rejects
2. Much longer die life due to reduction of scale
3. Very low maintenance—compared with rebuilding brick-lined furnaces
4. No heating-up time required with TOCCO
5. Absence of heat and noise—for better working conditions

50 kw 10,000 cycle TOCCO machine heating bolt blanks

SEE OUR CATALOG IN SWEET'S FILE MECHANICAL INDUSTRIES

Why not have a TOCCO engineer find out how TOCCO can help reduce *your* forging, brazing, melting or hardening costs—no obligation.

THE OHIO CRANKSHAFT COMPANY

TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. B-9, Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Heating for Forming and Forging".

Name _____

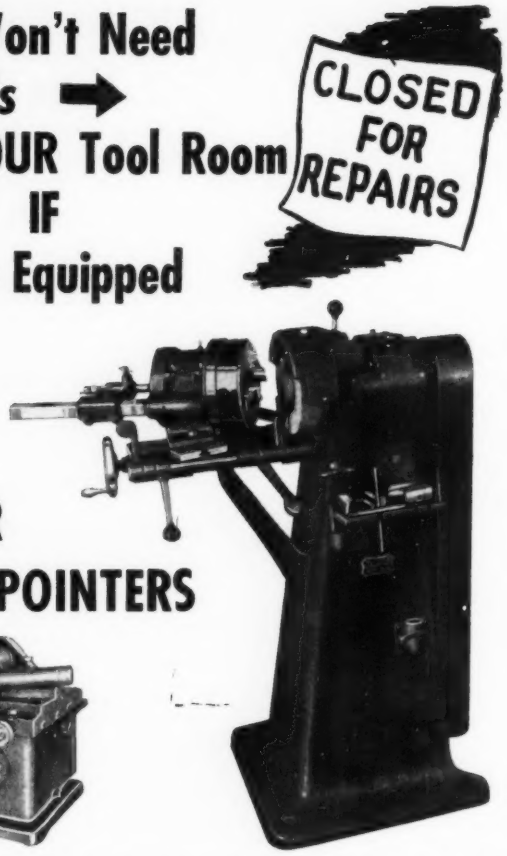
Position _____

Company _____

Address _____

City _____ Zone ____ State _____

You Won't Need *this* ➡ For YOUR Tool Room IF You're Equipped With OLIVER DRILL POINTERS



To maintain production schedules your drills must be kept in proper condition. Machine grinding is generally accepted as the most accurate method for sharpening drills. OLIVER Drill Pointers give balanced cut with each lip doing equal work. It has been established that many production slowdowns due to excessive drill costs and imperfect holes can, in many cases, be traced to improper grinding of the drill points. On the other hand, properly machine ground drills cut faster, last longer and produce more accurate holes.

LET US PROVE IT — Send us a few of your drills to sharpen — then check the results on your own production. No obligation.

Just a Tip BE WISE — OLIVERIZE **Use OLIVER Drill Pointers**

No. 510 for drills ¼" to 3" — 2-3-4 flute. Variable clearances. Variable point angles. Automatic operation.

No. 21 Oliver Bench Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for literature that will save you dollars in your toolroom.

OLIVER INSTRUMENT CO.
1414 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—REMAKING MACHINES

do not get down to high production again until ten minutes after the period is over. Perhaps all this can be made up in the next few hours. Yet in general, from a rough analysis of the efficiency of workers it would appear that they go along on quite an even keel. No outstanding pickup which would indicate an attempt to offset lost time.

How can we improve working conditions without making a social tea time each day? This can be done but usually companies do not like to follow through. First, the company should make a complete study of working conditions. Determine those jobs which cause fatigue. Study ways of eliminating the fatiguing portions of those jobs. This is a constant process . . . not one to be done today and forgotten tomorrow. Clean up restrooms for men and women. Make them more than just a toilet. Keep them clean and painted with restful colors. Clean up the work areas and machines. Introduce music into the plant properly toned for the various departments. The music can do nearly as much for fatigue relief as can a cup of coffee and without the lost-time element.

The aforementioned procedures can only be accomplished by companies who are ready and willing to devote time to better human relations without taking the supposedly easiest way out. Nothing which is done merely becuse it appears to settle the issue is ever the best method of solving the problem.

Charles D. Townsend
W. Hartford 7, Conn.

•

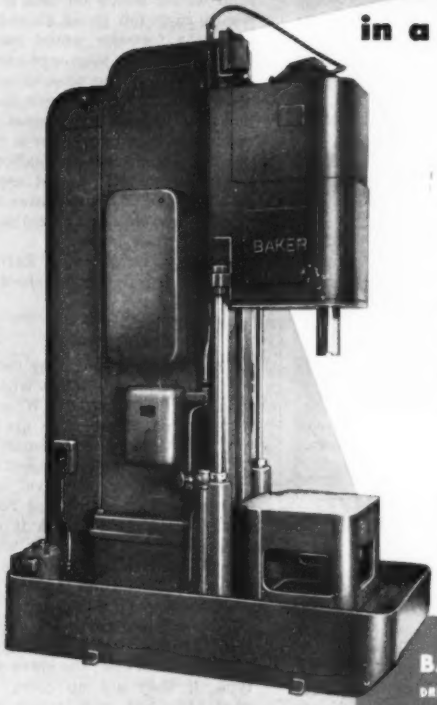
IN OUR PLANT the employees start at 7 and work until 12. This is a 5-hr stretch, and if it wasn't for the coffee time at 9:30, I doubt if our output would be what it is. Previously, the employee would walk off the job about 11 for a bite because he was hungry. Anywhere between 10:30 and 11:30, there was a steady flow of people to the locker for a pickup or a smoke. For specific reasons we did not wish to change the starting time or the lunch time. By having an informal coffee period for 15 min every morning we saved at least a half-hour of production.

Most plants nowadays have a formal coffee period. These range from a complete shut-down to sipping while operating a machine. The coffee is brewed in the plant, brought in from the corner store, or brought from home in a thermos. Some plants do not permit smoking during working periods and use the coffee time to allow the employees to grab a

BAKER

The Versatile BAKER 36HO DRILL...

provides increased productivity in a multitude of applications!

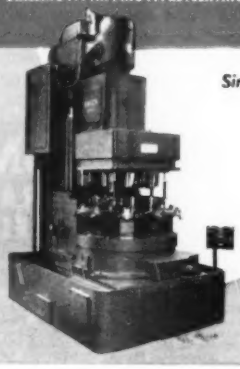


The standard Baker 36HO Heavy Duty Vertical Hydraulic Drill may be adapted to a multitude of multiple or single spindle drilling, boring, counterboring, spot facing or reaming operations. Provision for pick-off speed changeovers gives extreme flexibility of spindle speeds. The machine is of hydraulic saddle type feed and may be furnished with either standard plain table or indexing table with up to six indexing stations. Ample capacity is provided to drive one 5 inch diameter High Speed twist drill, drilling from solid in SAE-1035 steel. Write Baker concerning your specific job problem.

BAKER BROTHERS, INC., Toledo, Ohio

DRILLING ... TAPPING ... KEYSEATING and CONTOUR GRINDING MACHINES

Illustrations show Baker 36HO as adapted for drilling wrench bodies for a leading manufacturer of crescent wrenches. Estimated production rate is 103 parts per hour at 100% efficiency. Machine is easily converted for operations on varying sizes of wrenches.



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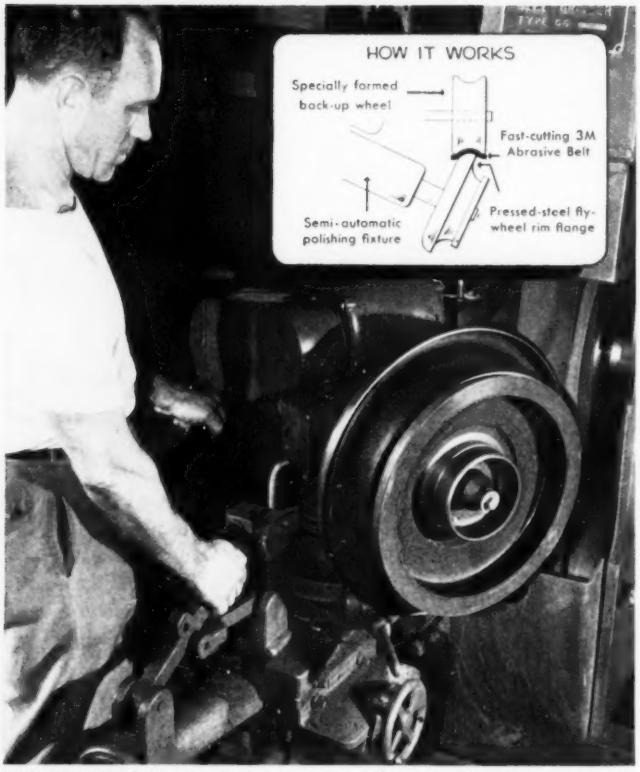


SEMI-AUTOMATIC polishing fixture spins and turns 20" pressed-steel wheel against 3M belt. Back-up wheel is formed to mate with curve of flywheel flange.

"Formed-wheel" belt grinding cuts 3-step job to one!

3M ABRASIVES SLASH GRINDING TIME 71% AT AMERICAN TYPE FOUNDERS

Time study figures prove it! Formed back-up wheels and 3M Abrasives are saving American Type Founders $1.15 on every "Little Giant" press flywheel they finish. A one-step operation now gives these wheels a smoother, cleaner surface in only 7¼ minutes instead of 25 minutes with the former 3-step method, saving 71% on time alone.

Diagram above shows how formed back-up wheel matches the contour of the flywheel rim.

You can make savings in time and money on *your* heavy grinding and finishing by consulting one of our experienced Methods Engineers. No obligation! Write Dept. AM91 for this 3M consultation service.

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Adhesives. General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Minnesota Mining & Mfg. Co. of Canada, Ltd., London, Canada

morning smoke. This period usually does not exceed 15 min and control is under the foremen.

In various plants where I worked there was always some sort of coffee time formal or informal. The informal consisted of a couple of fellows meeting in the locker room and drinking from a thermos while we had a smoke. This session generally took 10 to 15 min, but a session on the ball game or a fight, would last a half hour or until the foreman broke it up.

The formal coffee time was started with the whistle and ended the same way. During this period the entire shop would knock off and if there was a rush job going through the shop, the foreman would pace the floor until coffee time was over.

Generally, coffee time does more good than harm. It gives the employee a pick up and creates better relations. If the employees are given the impression that the coffee time is a privilege that can at any time be abandoned if abused there should be no trouble in controlling the length of time taken.

Frank J. Zarnowski
Rutherford, N. J.

•

TURNABOUT

AL HAS the right idea. Why shouldn't a workman want to know what kind of a guy the boss is? When jobs were scarce a man was glad of a job, even though the foreman might be a grouch and unreasonable in many ways. As Al says, a man spends a lot of his waking hours in the shop. If the foreman is not an agreeable man to work with he wants to know it before he takes the job.

What Al says about some of the old-time foremen is all too true. Many of them were just tough guys, and not much else, the slave-driving type. If they got up cross, had a poor breakfast, and it was a cold, blustering morning, they were in no mood to be even decently civil to the men who had to take orders.

Al might have gone further and said that many of the questions asked applicants by the personnel department should be abolished. Some of the old application blanks asked questions that had no bearing on the man's ability to do the work, or his reliability. Some even asked about the applicant's financial standing, his church affiliations and other equally impertinent questions. It would be more to the point to have the applicant inquire as to the firm's ability to pay his wages.

I recall one case where a man was hired in a hurry for a rush job without giving "personnel" time to check on his application statements. When they did, they found that few of them were true. So they called him and his foreman into the office and fired the man. Then they asked him why he had lied.

"I've been turned down every time I told the truth. I haven't any money in the bank. I don't go to church. But I knew I could make good if I got a chance. Ask the foreman if I haven't."

"But," the boss said, "we can't keep a man who will lie that way to get a job."

Here the foreman chimed in with, "Oh! yes we can. He's the best man I've got and he's doing some mighty important work now. Fire him and you'll pay a pretty penalty on that special job. We haven't got another man that can handle it on time. Quit asking fool questions and we'll get better men, I think."

The man stayed and worked long and well for the firm in question.

Fred H. Colvin
Point Pleasant, N. J.

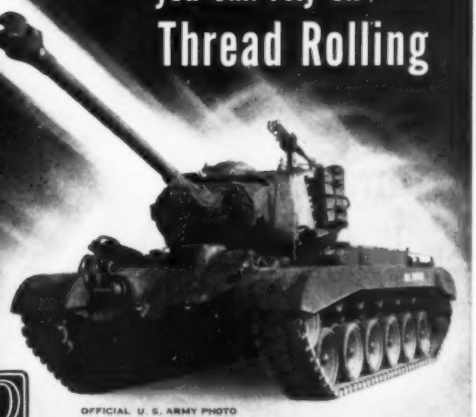
•

IF I WERE young again I think I would, if looking for another job, investigate what I was going into pretty thoroughly before "signing on the dotted line." One of the first things I would want to be informed on would be the dependability of the firm in order that my efforts would not be in vain.

Almost every man who is worth his salt looks forward to successful advancement throughout the years of his employ. I'd make a request to look over, and converse with, the one who was to be my immediate "superior" in order to get an idea just what kind of a human being he was. Many of my working hours would be spent with him and I certainly would want them to be a pleasure—not a living hell. I'd want to know if I could respect him before saying that I would take on the job.

I just know that some free-enterpriser is going to tear his hair by the roots when he reads this and say: "Just who in hell does that bald-headed——think he is that he can be choosy; I'd like to have him in my department just fifteen minutes!" Why should the worker be so thoroughly scrutinized by the super-analyzing personnel while he has no opportunity of seeing the other fellow's cards? Why should I have to divulge the nature of my grandparents' idiosynocracies while the probable offspring of some self-

When Our Armament depends on *Strength* you can rely on Thread Rolling



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As a pioneer in thread rolling, Reed has worked closely with the Air Corps, Army and Navy in engineering the various applications of thread and form rolling. Reed equipment has provided an economical method of producing precision parts at lower manufacturing, assembly and inspection costs.

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Makers of Hand and Power Hack Saw Blades, Frames, Metal Cutting Band Saw Blades and Clemson Lawn Machines.

1082A

ish, cantankerous old goats be permitted to stand on the pedestal of honor?

In my active days in industry I've had to put in many hours of my valuable four-score-and-ten trying to cooperate conscientiously with some of the most conceited asses who through some freak of chance were entrusted with the job of getting work out of we poor suckers, who through circumstances beyond our control, were forced to take what was handed out. One of my bosses was built like a freak from Mars; he never smiled and didn't lose any time to raise hell if something didn't run to suit his peculiar fancy. Another was envious of my ambition and waited like a prowling cat for the chance to give me the yellow slip at the first opportunity. Then there was Bill—dear old Bill—who through the fortune of birth happened to be a nephew of the big shot. Bill was a good egg and one could wrap him around his little finger any time he had a mind to—as for knowing anything about the trade he was decidedly on the outer edge.

To offset all this I have been very fortunate in working for real men who were a pleasure to be associated with. Luckily this type was in the great majority. There is nothing that will spur the worker on more than the knowledge that the one he is working for is "big" and who's knowledge and experience is worthy of the position he holds.

When one considers that we are allotted only a distressingly-few years on this throat-cutting sphere, it seems only logical that we do a little checking up on things so as to make those years the hyperion of delight. While it is necessary for

"One minute he was standing here working on the new secret weapon—the next, pfft!"

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the worker to be skillful and experienced, he should possess a burning conscience which impells him to do his best. He should possess a goodly supply of that growing science, psychology, which would enable him to get along with others —particularly some of the foremen he has to associate with.

John Homewood
Ontario, Calif.

•

WHEN a prospective new employee goes looking for a job, he is as much concerned with working conditions as he is the size of the paycheck. The new worker's impressions for good or bad are at the first contact with the foreman. He wants to know he is going to get what's right for what he does. We all want to know what kind of a boss we are going to work for. People do not differ much in what they want from life. They differ only in the approach to that attainment. This prospective employee probably wants to know direct from the foreman if the job has a ladder to it. He also wants to know if it's a good place to work, and a chance to show one's individuality.

We all want human treatment by those for whom we work. We all want attention and encouragement. The fellow we work for is a very important factor. We also want the opportunity to be able to suggest or criticize without fear or reprisal. For this reason I would be happy to have myself analyzed by the new employee.

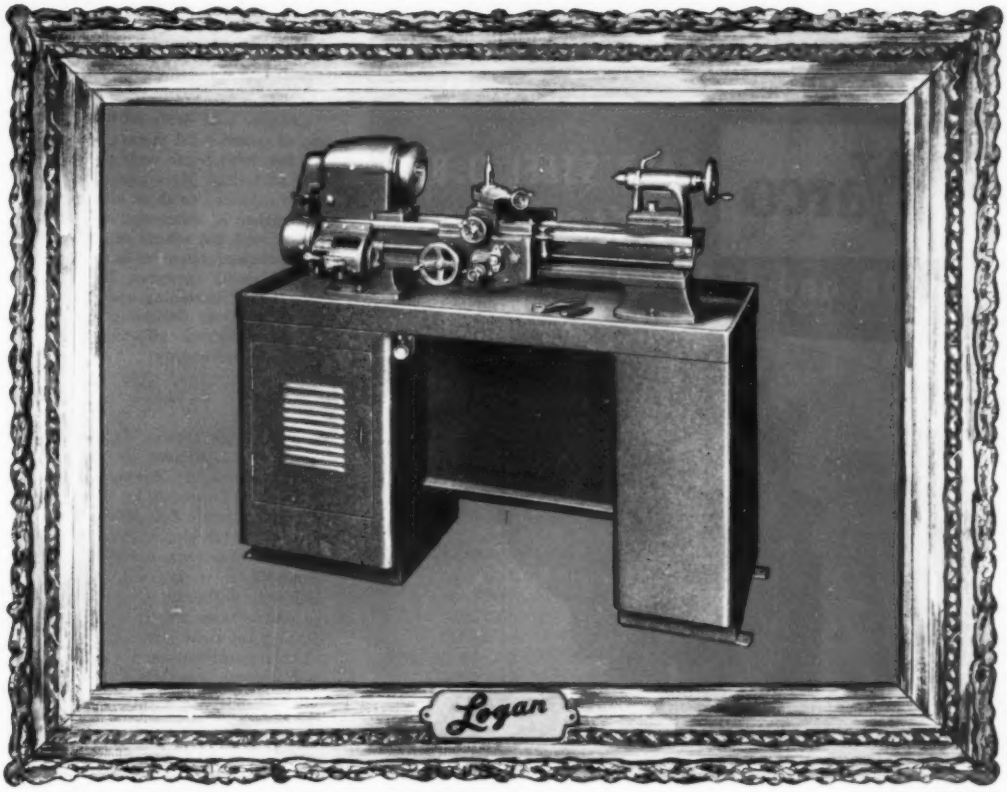
A. E. Salmons
Philadelphia

NEW BOOKS

WELDING PRINCIPLES FOR ENGINEERS. *By J. L. Morris, Ass't. Professor, Mech. Eng., Georgia Institute of Technology. Published by Prentice-Hall, Inc. 70 Fifth Ave., New York 11,, N. Y. 511 pages. Price $7.00.*

A college text for engineering students, dealing with the whole science of welding from the strictly engineerng standpoint, has long been needed. It is presented here for what is believed to be the first time.

The first chapter deals with welding metalurgy and the metallurgical phenomena in the locality of the weld and their influence on the finished product. In the second chapter, the various welding processes are



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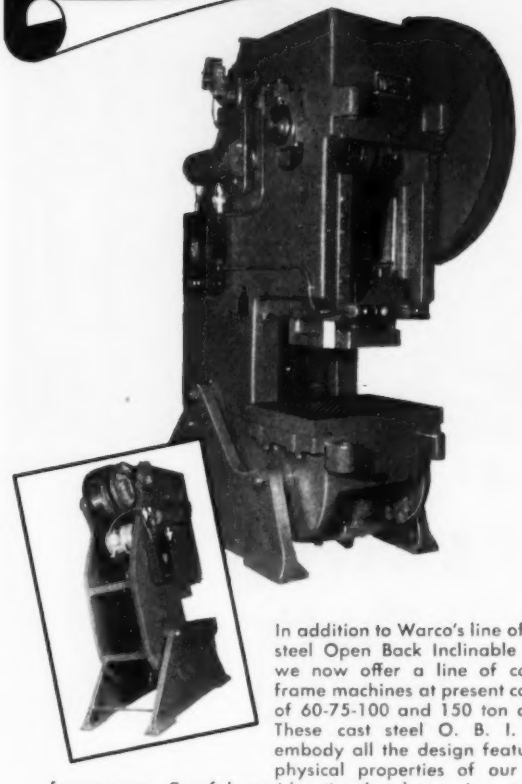

In addition to Warco's line of welded steel Open Back Inclinable presses, we now offer a line of cast steel frame machines at present consisting of 60-75-100 and 150 ton capacity. These cast steel O. B. I. presses embody all the design features and physical properties of our welded frame press. Careful consideration has been given to proper distribution of metal so as to provide maximum stiffness and rigidity.

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surveyed, and their application and equipment explained. Methods and equipment for testing and inspecting welded joints are considered in the third chapter.

Chapter four deals with the welding of commercial metals, and chapter five with braze welding, brazing and soldering. Here again, the text is not intended to show how to weld, but rather is concerned with weldability and the effects of welding.

Subsequent chapters deal with surfacing, metal spraying, filler materials, flame hardening, cutting, stress and distortion, designing for welding, and factors affecting welding production economy.

•

HANDBOOK OF POWER RESISTORS. *By H. F. Littlejohn, Jr. Edited by Christian E. Burckel & Associates. Published by Ward Leonard Electric Co., Mount Vernon, N. Y. 196 pages. Price* $3.00.

Much has been written about control components in general, but this is the first authentic treatise devoted to power resistors. It is designed to furnish the reader with a knowledge of their contribution, application and performance characteristics.

The first chapter deals with definitions, standards and calculations; the second, with materials used in resistor construction. Chapter three discusses the various types, with performance and application data. Following chapters are concerned with resistor selection, standard stock types and sizes, manufacture, NEMA standards, and basic definitions.

•

REVIEW OF CURRENT RESEARCH AND DIRECTORY OF MEMBER INSTITUTIONS—*Published by Engineering College Research Council of the American Society for Engineering Education, Georgia Institute of Technology, Atlanta, Ga. Edited by John I. Mattill, Secretary, at Massachusetts Institute of Technology, Boston, Mass. 243 pages.*

This bulletin lists member colleges and universities of ECRC, designates research directors and heads, indicates general research policies, lists short courses being given outside the regular college studies, and lists research subject presently being pursued. An index by research subjects allows finding which colleges are engaged in specific types of examiations.

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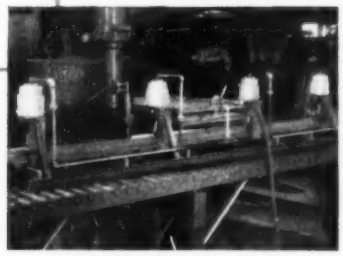
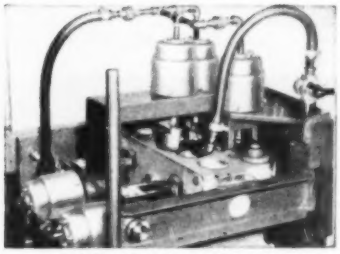


REDUCES OPERATOR FATIGUE

Four Rotochambers installed on the fixture in this spot welding operation replaced cumbersome hand clamps, saving time, greatly reducing operator fatigue.



SPEEDS INSPECTION METHODS

Installation of Rotochambers on this water test operation for engine castings eliminated hand operated fixtures, thereby speeding inspection and cutting costs.

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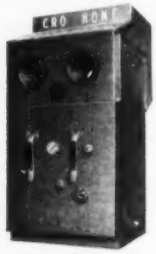

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The Cro-Hone Pressure-Blast can be operated at ***lower velocities*** for general surface finishing, pre-plating or pre-painting cleaning and the maintenance cleaning of all kinds of metal parts, tools, dies, molds, etc. At ***greatly increased*** velocities the unit is immediately adaptable to difficult descaling jobs and the close tolerance deburring of intricate recesses, spirals and long internal bores. (Uses a range of metallic or non-metallic abrasives from 45 to 5000 mesh)

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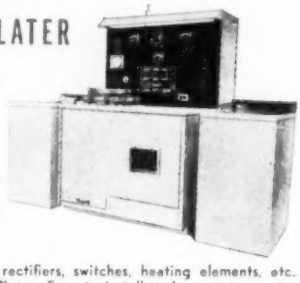

All necessary controls, rectifiers, switches, heating elements, etc. are built into the Cro-Plater. Easy to install and easy to operate, the unit can be used as an integral part of a high production plating set-up or for occasional use in the toolroom, pilot plant or laboratory. The work that can be effectively plated in the Cro-Plater is not limited in any way by available amperage. (Cro-Sol, a specially designed high-speed chrome plating solution, is offered to purchasers of the Cro-Plater.)

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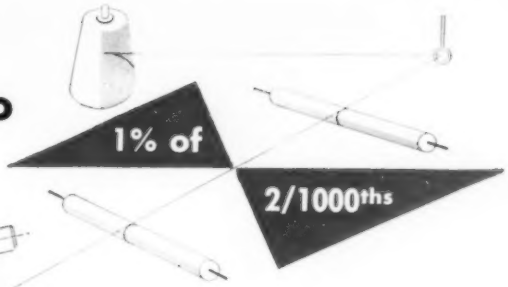
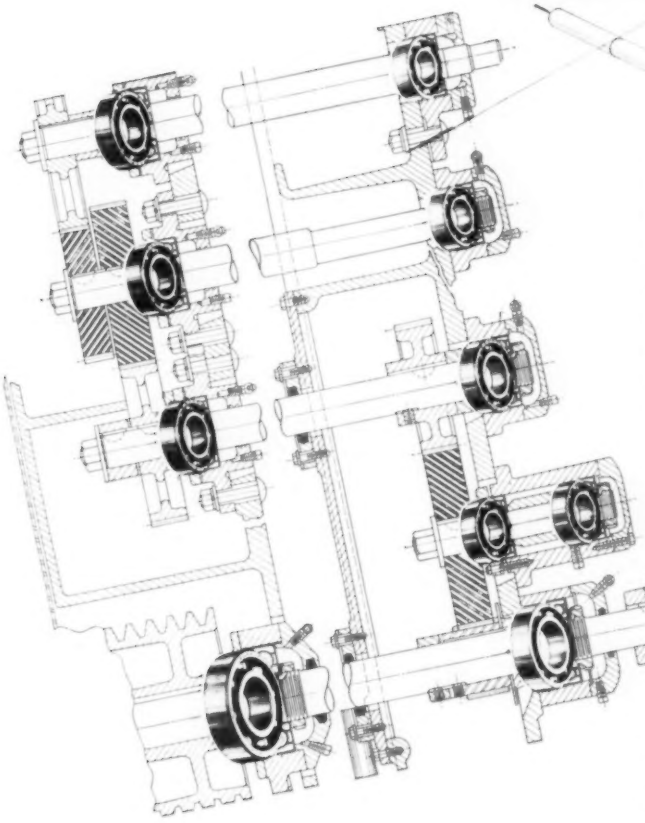




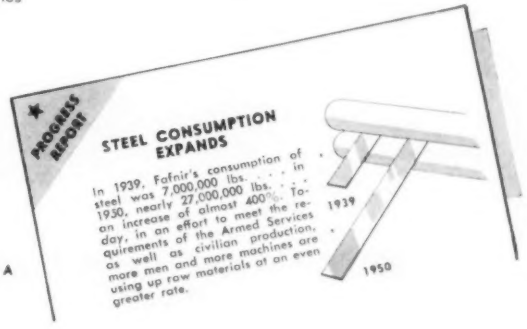
Bearings used
Fafnir Extra-Precision Ball Bearings of the 200 (Light) and 300 (Medium) Series are shown in the ten locations above.

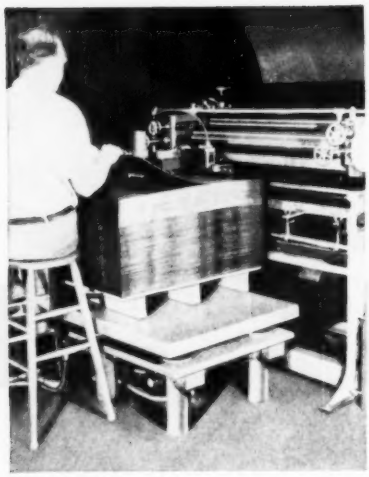
If you are familiar with machine designing, you'll consider this a "neat" piece of engineering. Such precision is actually achieved on mammoth synthetic thread twisters developed by Whitin Machine Works. The twisters stretch thread to a uniform .002 of an inch diameter and hold that diameter to within a 1% tolerance down a 40 foot line of spindles.

A sectional view of the head end which controls the "feed rolls" and "draw rolls" shows the Fafnir Ball Bearing setup that helps to keep their relative velocity absolutely constant . . . a "must" to produce such an amazing degree of accuracy. The Extra-Precision ball bearings used are made by highly trained operators on special equipment controlled by elaborate inspection devices.

Whatever your bearing problem, a few minutes spent with a Fafnir representative may help you solve it equally as successfully. Fafnir's experience is not limited to just a few industries . . . it's industry-wide. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA


PROGRESS REPORT
STEEL CONSUMPTION EXPANDS
In 1939, Fafnir's consumption of steel was 7,000,000 lbs. . . . in 1950, nearly 27,000,000 lbs. . . . an increase of almost 400%. Today, in an effort to meet the requirements of the Armed Services as well as civilian production, more men and more machines are using up raw materials at an even greater rate.
1939
1950



Previous to installation of the automatic, self-leveling **Portelvator Packlifter,** the sheet feeding operation shown here was performed from a standard four-wheel floor truck. This involved stooping and lifting, and resulted in unused machine capacity. Application of **Portelvator** Material Positioning Equipment increased daily production to such extent that installations were made at 6 additional locations.

YOUR PROSPECT FOR COST REDUCTION IS

Excellent

Time after time after time, the application of **Portelvator** to material positioning at the machine has resulted in such savings that problems, which seemed to have only a remote relationship to the operation, have vanished. If you have one machining operation where mechanical material positioning can be applied, your prospect for cost reduction is excellent.

Write for information about the easiest way to replace brawn, your most expensive component. Ask for our free Bulletin No. P-503.

PORTELVATOR ®

Portelvator is the registered name for the Handy Hamilton Portable Elevating Table. Standard models have lift capacities of 1,000 — 2,000 or 5,000 pounds, and lift travels to 58" above floor level. Lift is transmitted through worm, worm gear, and screw. Lift principle removes all possibility of tipping, slipping or settling under the load.

Modified designs, with various power applications and controls, are used throughout industry for lifting and leveling safely and "as planned"

THE Hamilton TOOL COMPANY
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

industry is becoming more generally appreciated, as indicated by the number and expense of research projects listed in this bulletin. One page, for example, listing part of Cornell University's research program, includes mention of these projects of value to the metalworking field:

Piezoelectric pressure gages
High-temperature testing
Dynamics of flexible chains
Metal cutting
Residual stresses in machined surfaces
Analysis of materials handling related to cleaning
Production planning and control
Gripping power of chucks
Force in cutting, and stress in chips
Review of data on cutting
One-component lathe-tool dynamometer
Machinability on nodular cast iron
Dynamically loaded sleeve bearings
Misalignment of high-speed plain bearings

Obviously, industry will profit from these investigations. The bulletin is not only an index of current research and an indicator of new information that will soon be available, but is useful as a directory of colleges that may be able to handle special research problems encountered by industry.

•

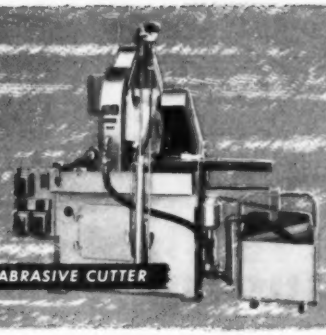
VIBRATION AND SHOCK ISOLATION—*By Charles E. Crede, Chief Engineer, The Barry Corporation. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 328 pages. Price $6.50.*

Isolation can be utilized to protect machines and devices from shock, vibrations, or sound; each different problem requiring a different kind of isolation. Therefore, the generic term should be "isolation", not "shock mounts".

The author frankly presents little new or original material in the book, but has compiled in book form as much basic, engineering, and technique information as possible from widely separated sources. The text is slanted for practicing engineers who may deal with isolation and for students. It is a reference book, but with little value to the shop man.

Such subjects as moments of inertia, elasticity of isolators, vibration modes, natural frequencies, velocity of shock, preloading, vibration dampening, properties of isolators and isolating materials, and their applications are covered.

Try this Better, Cheaper Way to Cut—



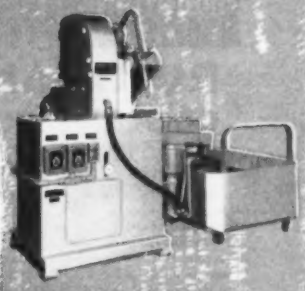
MODEL 406 ABRASIVE CUTTER

CAMPBELL ABRASIVE CUTTERS

Abrasive cutting saves time. It usually saves a finishing operation because the cut ends are smooth and practically burr free. The abrasive wheel cuts through hardened or annealed steel, non-ferrous metals, plastics, too. Length of cut is controlled to within a few thousandths of an inch.

Safer to Use — CAMPBELL ABRASIVE CUTTERS are safer to use because cutting wheels are enclosed in steel. Work clamp, work stop, and coolant pump are automatic. Coolant is distributed equally over work. Wheels last longer, quality cuts are produced.

Choice of Styles — There are sizes and styles of Campbell Abrasive Cutters for every job. All are completely re-engineered for production performance . . . ready for the emergency.



MODEL 223 ABRASIVE CUTTER

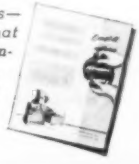
MODEL 15 ABRASIVE CUTTER

AND . . . CAMPBELL NIBBLERS

Cutting odd shapes from sheets of ferrous and non-ferrous metals is quick and inexpensive on a CAMPBELL NIBBLER. A rapid circular punch and die take "bites" out of sheet guided by operator. Work feeds in any direction. Any shape of hole can be cut in center of sheet without cutting perimeter. 40 to 60 times faster than drilling and filing.

MODEL 2524 NIBBLING MACHINE

YOU TELL US—Campbell has the machines—Abrasive Cutters and Nibblers. You tell us what your job is. We'll send literature and make recommendations.



Ask for your copy of Bulletin DH-171

ACCO

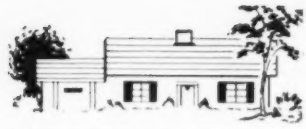
TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

923 Connecticut Ave., Bridgeport, Conn.

CAMPBELL Abrasive Cutters AND Nibblers

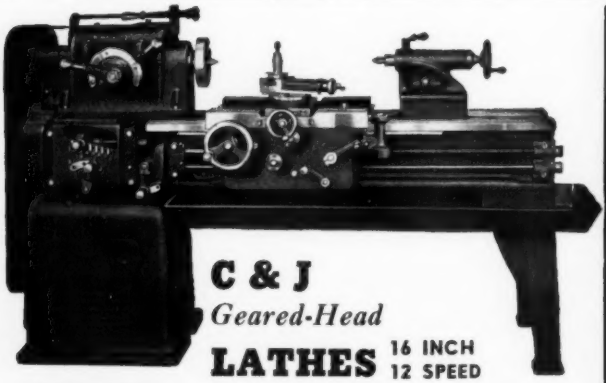
HOME APPLIANCES or MUNITIONS



RUTHMAN GUSHER
COOLANT PUMPS
DO THE JOB!

In thousands of plants all over the free world Ruthman Gusher Coolant Pumps are busy speeding the production of metal parts for everything from home appliances to munitions.
Everyone at Ruthman—engineers, machinists, executives—is proud of the fact that these Gusher Pumps can be depended on to do their job well, for Gusher Pumps are designed and built to take that extra strain extra effort, that increased civilian and military demands require.
For a pump that can be depended on, that requires minimum maintenance care and does its job efficiently and economically, you can't beat Ruthman Gusher Coolant Pumps. Write us today. We'll be glad to supply additional information.

THE RUTHMAN MACHINERY CO.
1818 Reading Road | Cincinnati, Ohio



C & J
Geared-Head
LATHES 16 INCH 12 SPEED

ONLY ONE MODEL · ONLY ONE SIZE

FOR HIGH GRADE PRACTICAL GENERAL SERVICE

- Tooled and equipped for efficient production
- Exceptionally long carriage bearing—23½ in.
- Feed provided by separate rod—lead screw is used only for thread chasing

Complete regular equipment includes thread indicator.

Guaranteed accurate to good commercial standards. Write TODAY for new bulletin 38-A-8.

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

Put Mirror Finish on Carbides

BY STANLEY W. LOVEJOY
Tool Supervisor, General Electric Co.

THERE ARE three main advantages of mirror finishes on carbide tools:

1. Much less resistance to chip flow on the tool face; therefore less tool loading and cratering.
2. Much less frictional heat from chip rubbing, especially on tools with little or no relief.
3. Keener cutting edge and better work done.

Attention to these points produces a much longer tool life between grinds. In some authenticated cases, where a commercial finish from a 320-grit wheel was replaced by a mirror finish, increases in life ranged from 200 to 6000%.

Producing a mirror finish is fairly simple. A cup-shaped wheel of 220 or 380 grit is mounted on a surface grinder, and is balanced perfectly. The machine spindle must be free from end play, the table must travel smoothly and true, and the wheel should pass off the work at both ends of the stroke. With a 380-grit wheel, the diamond particles extend about 0.0004 in. beyond the bonding material, and the recommended infeed is half the exposed diamond depth—0.0002 in. This allows chip space between the points to prevent wheel loading.

After sizing, wheel feed should be reduced to 0.0001 in., and a spark-out period of five to ten passes should be allowed after no cutting noise can be heard. Coolants are recommended, although not essential.

Mirror finishes can be produced in a small shop without a grinder. Off-hand lapping can be done with a wooden lap, shaped like a cup wheel and charged with compound. The work must, however, have a good-grade commercial finish before starting the superfinishing job. Another method is to lay a piece of ordinary paper on a surface plate, smear it with diamond compound, and rub the tool over the surface. The paper lapping surface might be glued to a lathe faceplate.

Here's how
PRATT & WHITNEY AIRCRAFT
does it!

Production men know that when you talk about drawing and forming alloys which are composed largely of nickel and chromium—you have a tough job ahead. Yet at Pratt & Whitney in East Hartford, Connecticut, such alloy pressings are economically handled by **5** H-P-M FASTRAVERSE Presses for the Pratt & Whitney Aircraft J-42 Turbo-Wasp (gas turbine) engine. Moreover, these parts are drawn to very close limits to avoid machining and yet allow the close fits required for welding. Stainless (AMS 5510) as well as low carbon steels are also formed on these presses.

The choice of H-P-M presses for this job is just an example of the leadership H-P-M enjoys in the metal working fields. H-P-M features such as wide ranges of operational speeds and controls . . . automatic cycle . . . FASTRAVERSE "closed-circuit" hydraulic power system . . . low scrap loss and top operating economies are just a few reasons why H-P-M presses can solve your production problems. Call an H-P-M engineer today.

Send for a free copy of Bulletin 5005 which completely explains H-P-M FASTRAVERSE Press operations and features — and also describes "special application" H-P-M Presses.

HPM

THE HYDRAULIC PRESS MFG. CO.

1002 Marion Road, Mt. Gilead, Ohio, U.S.A.

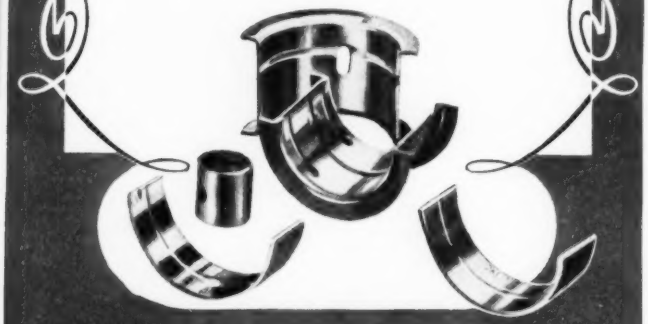
Makers of Presses for the Metal Working and Processing Industries · Plastics Molding Presses · Die Casting Machines Hydraulic Pumps, Valves and Power Units.

SERVING INDUSTRY THROUGH HYDRAULICS

JOHNSON BEARINGS
1901-1951

HORSEPOWER Today—Not Horses

NEVER BEFORE in the history of the world has such power been available. Present day automotive engineering is producing means of transport of great capacity, speed and roadability. Hand in hand, Johnson Engineers have constantly improved and devised sleeve bearings to meet these greater demands. Much of today's greater power is paralleled by the 50 year's progress in Sleeve Bearings by Johnson Bronze.



SLEEVE BEARING HEADQUARTERS *Since* 1901

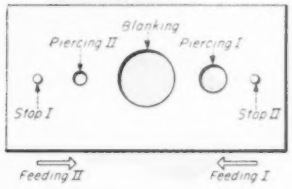
Johnson Bronze

515 SOUTH MILL STREET · NEW CASTLE, PA.

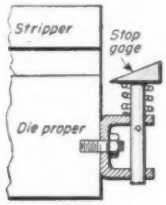
Heat, in all cases, must be avoided in superfinishing; therefore the pressure against the work must be low. Use the side of a wheel instead of the periphery.

DIEMAKER'S KINKS

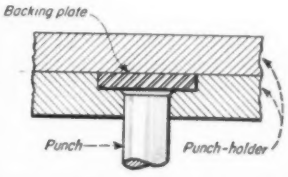
BY FEDERICO STRASSER



DOUBLE-USE DIES are employed for short-run jobs, when some common feature of the two workpieces permits. For example, two washers of the same OD and different hole diameters are accommodated by changing the feeding direction, the position of the stop pin, and using the correct size of punch.



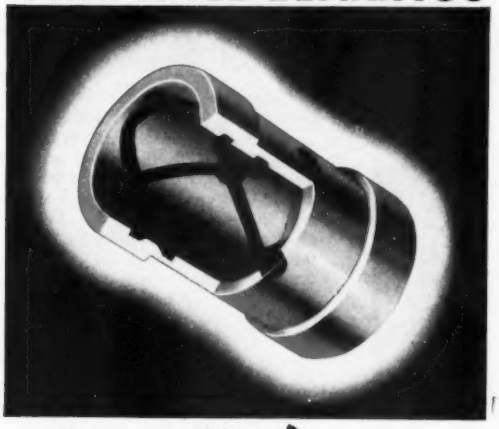
SPRING-ACTUATED stops avoid the need for lifting heavy stock over a fixed stop pin. The stock is shoved over the wedge-shaped stop, which is spring supported and pops up when the blanked aperture passes over it. Then, the operator pulls the stock back until the gage registers with the wall of the opening.



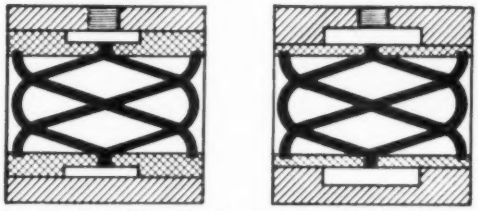
HARDENED backing plates take the thrust of small punches, prevent indenting the punch-holder. Employ them when the punch diameter is less than three times the

RANDALL

GRAPHITED BEARINGS



Controlled Lubrication!



Accurately controlled lubrication is simple with Randall Graphited Bronze Bearings by use of oil reservoirs.

At the left is shown an undercut on the outside diameter of the bearing. When bearing is pressed into the housing this undercut provides a reservoir for oil which is replenished from an oil cup or oil line through the housing.

At the right the oil reservoir is formed by a cored or machined undercut in the housing. Oil is fed by way of porous graphite feed plugs extending through the wall of the bushing to the graphited grooves in the inside diameter. Rate of flow in either case is governed by the number and diameter of feed plugs in relation to the size of bearing. Being heat responsive, excess friction caused by overload or foreign elements is quickly dissipated by increased feed of lubricant. Randall bearings with reservoir or undercut on outside diameter can be used to replace other types of bearings without changes in the design of equipment.

Write today for catalog GB43 which gives complete information on all types of Randall graphited bronze bearings.

BRONZE BAR STOCK
BRONZE BUSHINGS
PILLOW BLOCKS
SHEET LUBRICATOR

Randall

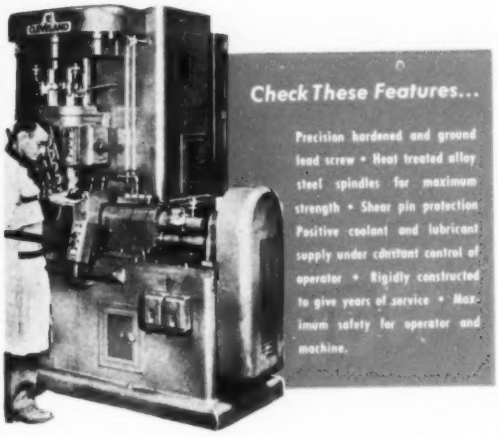
GRAPHITED BEARINGS
THRUST WASHERS
BABBITT METALS
SAFETY COLLARS

RANDALL GRAPHITE BEARINGS, INC.

1005 S. GREENLAWN AVE., LIMA, OHIO

CLEVELAND tapping machines *lead screw*

Step up Production to Maximum Cut Operating Costs to Minimum


Check These Features...
Precision hardened and ground lead screw • Heat treated alloy steel spindles for maximum strength • Shear pin protection Positive coolant and lubricant supply under constant control of operator • Rigidly constructed to give years of service • Maximum safety for operator and machine.

Designed by CLEVELAND engineers after many conferences with leading firms in the pipe and conduit fittings industries, the new Series F machine is making production records. Three models . . . F-1, F-2, and FT-1 . . . are available. The F-1 and F-2 are fully automatic in operation, fed from a magazine type hopper, and do two 90° ells, street ells or reducer ells at each stroke of the machine . . . threading and chamfering simultaneously from the cored hole. The FT-1 will tap and chamfer complete two tees at each stroke of the machine. Fast accurate and sturdy . . . trouble free, producing parts which are square and within the required tolerance . . . these modern machines will step up production to maximum and cut down to a minimum your labor costs. Write for Catalog AM-5.

Meet Mr. Lead Screw . . .

of The Cleveland Tapping Machine Co. Mr. Lead Screw symbolizes the time-proved lead screw feed designed and pioneered by Cleveland . . . now generally accepted as the key to precision tapping at high speeds. Write for your copy of the Cleveland Production Tapping Guide and a copy of Catalog.

THE CLEVELAND TAPPING MACHINE CO.
A Subsidiary of AUTOMATIC STEEL PRODUCTS, INC.
CANTON 6, OHIO

Finest for SPEED: Taps more quality threads per hour, more holes than any other tapping attachment.
Finest for ACCURACY: Attaches firmly to drill press or tapping device.
Finest for VERSATILITY: Taps anything from soap to nickel steel without pressure on tap—prolongs tap life.
Finest for ADAPTABILITY: Five sizes, standard or built-in models, will fit any drill press or tapping device. 0-1½" cap.
Finest for MAINTENANCE: Requires little or no maintenance.
TORQOMATICS, when used with Jarvis TECNI-TAPS, make the finest possible combination for low-cost, high-quality tapping. Send for free, illustrated, descriptive literature to The Charles L. Jarvis Company, Middletown, Conn.

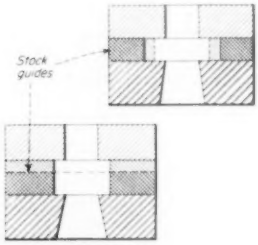
Jarvis POWER TOOLS

TAPPING ATTACHMENTS
TECNI-TAPS and DIES
ROTARY FILES
FLEXIBLE SHAFTS and MACHINES
QUICK CHANGE CHUCKS and COLLETS

stock thickness, and where there is not room to use headed punches. Thickness of the backing plate should be 0.1 in. min., 0.2 to 0.3 in. max.

A SWAB for hollow spindles is easily made from a stiff bristle brush. The 1½ in. dia size is good for ¾- to 1-in. spindle bores. Sweat a piece of copper tubing onto the wire shank of the brush, choosing a piece of tubing long enough to push the swab clear through the spindle. Form an eye in one end of the tube, so the swab can be hung up when not in use.

PLUGGED PAINT-SPRAY GUNS can can be avoided by slipping a rubber finger cot over the nozzle after each use. Ordinarily, if the painter must put down the gun for a few minutes, he is first forced to blow out the gun with cleaner, especially when quick-drying enamels or lacquers are being sprayed. A lot of time per day can be saved by keeping handy a supply of the rubber finger cots, which cost little by the dozen.



STOCK GUIDES of various thicknesses and widths can frequently be provided for in die design. Their use permits ready change of the height or width of the stock chan-

IT MAKES THE MAN OR
A DIFFERENCE THE MACHINE
WHETHER IS BUSY

a BUSY man
at an IDLE automatic
spells LOSS

an IDLE man
at a BUSY automatic
spells PROFIT

H & G INSERT CHASER DIE HEADS

are mechanically right, functioning flawlessly at high speeds for hours on end. They minimize down time, gaining as much as an hour a day in net production.

There's nothing like a demonstration to convince the man who must be shown.

Check and Mail for Free Copy
☐ "Selecting Proper Die Head for the Job"
☐ Style MM ☐ Style DMS ☐ Style DM ☐ Style TM

THE EASTERN MACHINE SCREW CORP.

Manufacturers of H & G General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines

20-40 BARCLAY STREET NEW HAVEN 6, CONNECTICUT

IT'S A
Mac-it®
PRONOUNCED "MACK-IT"

Mac-it Hollow Pipe Plugs — for accuracy, safety, uniformity and strength.

Built for Strength!

For the toughest kind of fastening jobs, the complete Mac-it line of heat-treated, alloy steel screws will give you the strength you need *where you need it!*

Mac-it's 38-years' experience in the manufacture of these top-quality fasteners is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada.

Other Mac-it products include:

Hollow Lock Screws
Socket Head Cap Screws
Hollow Set Screws
Stripper Bolts
Socket Screw Keys
Square Head Set Screws
Hexagon Head Cap Screws
. . . and many others

Marketed Nationally Since 1913 by
STRONG, CARLISLE & HAMMOND COMPANY
Cleveland 13, Ohio
Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.

Thousands In Use

BUT SELDOM SEEN ON THE RESALE MARKET

Because Users Keep Them—They Won't Wear Out

Model J, pictured, 10"x18" Capacity, available as a wet or dry cutting machine. Junior Model B, (with or without casters) 5" x 10" Capacity.

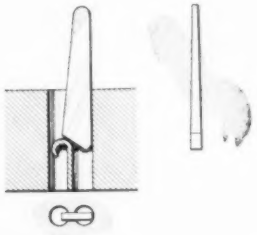
JOHNSON BAND SAWS Are a Fundamental Tool—Excellent Quality and Standards.

These superior saws stay on the job year after year, giving trouble-free service, because they're made right, from the best standard parts obtainable. They are the product of a long established, thoroughly experienced Company with a reputation for offering top values in modern metal-cutting equipment. For greater capacity, speed and efficiency, be sure to choose a oJhnson Saw. Write for catalog today.

There is a Dealer near you.

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

nel to accommodate various strip dimensions. Versatility is thus gained for cutting-off, cropping and shearing dies, especially.



DRIFTS for breaking away the bridge between holes drilled inside a blanking contour are generally home-made. This type, used with a pair of pliers, is slightly rounded on the side that bears against the hole wall.

Subcontractors Sought For Forgings, Castings

WASHINGTON—Navy procurement offices are now listing components in short supply which are required by prime contractors to complete work in process. Manufacturers with available production facilities should contact the listed contractor.

A list of fabricated metal items in short supply was carried in the Subcontracting News section of *AM*, Sept. 3. Subcontractors for forgings and castings are also sought by the following prime contractors:

• Forgings

Hardie-Tynes Mfg. Co., Birmingham—rough steel crankshafts.

Jerguson Gage & Valve Co., Somerville, Mass.—steel drop forgings, for gage assemblies.

Tubular Micrometer Co., St. James, Minn.—frame forgings.

B. K. Sweeney Mfg. Co., Denver, Colo.—steel forgings.

Besser Mfg. Co., Alpena, Mich.—small drop forgings, alloy steel.

J. A. Roebling & Sons Co., Trenton, N. J.—forged steel shackles.

Iowa Mfg. Co., Cedar Rapids, Iowa—steel forgings.

The Boyt Co., Des Moines, Iowa—steel forgings.

• Castings

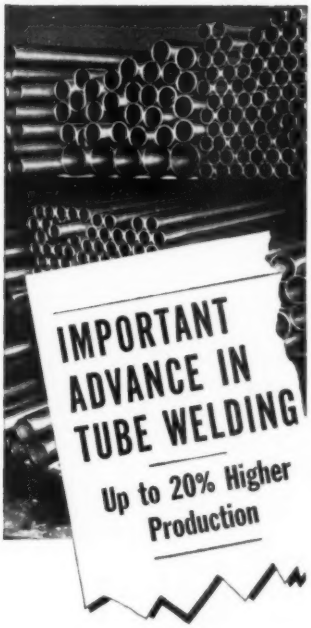
Louis Allis Co., Milwaukee—castings, all kinds.

Falk Corp., Milwaukee—steel castings, shafts.

Perfex Corp., Milwaukee—aluminum castings.

Warner Lewis Co., Tulsa, Okla.—steel castings.

Boston & Lockport Block Co., E. Boston, Mass.—malleable iron castings; medium steel castings.



● Yoder now announces the greatest forward step in tube welding since the introduction of the first patented Yoder Tube Welder in 1939. The enviable production records established by this welder largely account for the fact that Yoder have furnished more than half of all the resistance-weld tube mills since installed in the U.S.A.

The heart of the new welder is a transformer of revolutionary design. It consists of four smaller transformers surrounding a common core and making an assembly of unprecedented compactness and strength. Reduced impedance accounts for its higher electrical efficiency. It insures longer service life, fewer interruptions for servicing, repairs and maintenance.

Compared with the previous Yoder welder, the production gains may be as high as 20%; compared with other tube welders, the gain may be as high as 50 to 60%. These gains go far toward compensating for increased labor and material costs.

The welder is furnished with all new Yoder mills, and is also available for replacing welders in other makes of resistance-weld mills, to step up production and reduce conversion cost.

Descriptive literature, consultation and estimates for the asking.

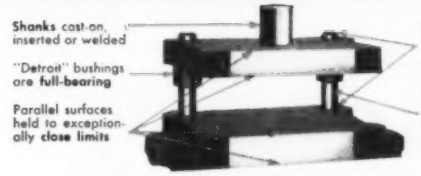
THE YODER COMPANY
5519 Walworth Ave. • Cleveland 2, Ohio

Resistance Weld TUBE MILLS
ENGINEERING YODER MANUFACTURING

YOU PAY FOR THE BEST . . . BE SURE YOU GET THE BEST

FACTORY-BUILT IS BETTER-BUILT

When you specify "Detroit" die sets, you are assured micro-metric precision that means: 1) Lower costs in mounting die in die set and 2) Longer, trouble-free production runs. Factory-built die sets give you what you pay for—parallelism, squareness and finish.


Shanks cast-on, inserted or welded
"Detroit" bushings are full-bearing
Parallel surfaces held to exceptionally close limits
Leader pin holes and bushing holes are micro-metric jig bored
"Detroit" precision leader pins are superfinished

Factory-built to the most exacting standards, "Detroit" die sets are also factory-assembled and factory-inspected. You don't have to re-work "Detroit" die sets in your shop to get the accuracy and performance you have a right to expect.

For prompt factory delivery, call "Detroit"

DETROIT	TR 2-5150	NASHVILLE	7-0437
BIRMINGHAM, ALA.	3-1341	PHILADELPHIA	VI 4-4084
BUFFALO	PA 9206	PITTSBURGH, Perrysville	4-5111
CHICAGO	PU 5-7694	ROCK ISLAND, ILL.	R.I. 8-2814
DAYTON	ME 3042	ST. LOUIS	FR 6811
GLEN RIDGE, N. J.	GL 2-5658	ST. PAUL	CE 1600
INDIANAPOLIS	HU 5604	SEATTLE	MU 2450
LOS ANGELES	AD 7251	TOLEDO	MA 4510
MILWAUKEE	GL 3-7170	TORONTO, CAN.	PL 3813
MINNEAPOLIS	PR 1822	WICHITA	5-8682
MONTREAL, CAN.	WI 1186	WINDSOR, CAN.	2-1575

DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

Nebel = *biggest lathe values*

the economical combination:
low initial cost...low operating cost

Nebel lathes offer more for your money because they're **basic** lathes . . . **simplified to meet current essentials.** Made in engine, removable block gap and extension bed gap models . . . in swing sizes 18" to 50" Write for descriptive bulletins.

THE NEBEL MACHINE TOOL CO.
Cincinnati 25, Ohio, U.S.A.

Control Costs with TOLEDO

On your scale material becomes money!

PRINTWEIGH STOPS ERRORS . . . Provides printed weight records — at the instant of weighing — assuring that the accurate indication of the Toledo dial reaches accounting records without chance of human error.

COUNTING SCALES

50th ANNIVERSARY 1901-1951

PORTABLE SCALES

FLOOR SCALES

TRACK SCALES

For the past half-century Toledo has been outfront in bringing you new and better weighing devices to help you *control costs!* 80% of the major advances made in scales during this time are credited to Toledo Research and Engineering!

Toledo engineering has not only specialized in the direct design of weighing mechanisms, but also in the many associated fields such as electronics, plastics, metallurgy, optics.

Check your needs *now*—select Toledo equipment for guarding your materials and costs! We will be very glad to send catalogs. Write today. Sales and service in 200 cities. Toledo Scale Company Toledo 1, Ohio

TOLEDO

HEADQUARTERS FOR SCALES
Leader in Modern Food Store and Restaurant Kitchen Machines

Warren Steam Pump Co., Warren, Mass.—centrifugal cast bushing; Meehanite castings; bronze castings.

E. B. Sewall Mfg. Co., St. Paul, Minn.—aluminum alloy castings.

O. C. Keckley Co., Springfield, Ill.—monel castings.

Hardie-Tynes Mfg. Co., Birmingham—cast steel, large head 49-S-1.

DeLaval Steam Turbine Co., Trenton, N. J.—steel castings, all kinds.

Clark Cooper Co., Palmyra, N. J.—steel castings, ½-in. valve bodies.

Attwood & Morrill, Salem, Mass.—bronze castings, valve-repair parts.

B. F. Goodrich, Troy, Ohio—aluminum & magnesium castings, for wheel assemblies, aircraft.

Meriman Brothers, Boston—bronze.

Forney Engineering Co., Dallas, Tex.—monel ring seat castings, for various size valves.

Names in the News

T. O. Kuivenen, R. F. Kymer, and **W. R. Crooks** have been named to the staff of the office of chief engineer, Cooper-Bessemer Corp., Mt. Vernon, Ohio.

John E. Ward has been appointed chief inspector, Youngstown Sheet & Tube Co., Youngstown, Ohio. He succeeds **Lewis W. Fogg, Jr.**, deceased.

Ira G. Needles has been elected president, B. F. Goodrich Rubber Co. of Canada, Ltd. He succeeds **George W. Sawin,** resigned.

Capt. Ellsworth E. Roth, (USN, ret.) has been named assistant to the works manager, defense division, Kalamazoo works, Ingersoll products division of Borg-Warner Corp., Chicago.

R. L. Howes has been named manager of quality and standards, X-ray department, General Electric Co., Milwaukee. He was formerly manager of employee and community relations for the department and in that position will be succeeded by **Richard C. Ehrman.**

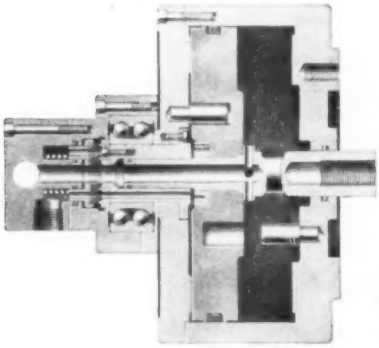
Industrial Briefs

Hotpoint, Inc., will build a plant in Milwaukee for the production of turbosuperchargers. This is in addition to two factories already nearing completion in Chicago which will provide a million sq ft of manufacturing area devoted to turning out jet engine components.

• **General Electric X-Ray Corp., Battelle Memorial Institute,** and **Haloid Co.** have launched a joint program for commercial development of zero-radiography, a fast, low-cost, dry direct-positive proc-

The *New* CUSHMAN Iron body Air Cylinders

SIMPLE, RUGGED, PRECISION-BUILT UNITS YOU CAN INSTALL ON YOUR PRODUCTION LINE AND *FORGET*



These new iron body air cylinders follow the well-proved design of our very successful high speed aluminum body cylinders. They are suitable for operating either Cushman Air Chucks or those of other makes. Note these important features: —

Cylinder Body is one piece casting, light in weight, yet ample in section. Bore is precision bored and piston fitted with special "O" ring seal. In addition, operation is protected by a graphitar disc air seal (patent applied for) that is pressure balanced under load. You will have no trouble with air pressure leakage under heaviest recommended production loads.

Large air ports speed operation. Static balancing after assembly eliminates vibration. Installation, controls and operations are very simple.

Write for bulletin No. PO-8. And please anticipate your needs, since deliveries are tightly scheduled.

THE CUSHMAN CHUCK COMPANY, HARTFORD 2, CONNECTICUT

CUSHMAN CHUCKS

A World Standard for Precision

Cushman also manufactures Hand Operated Chucks, Power Operated Chucks and Electric Power Wrenches.

10551

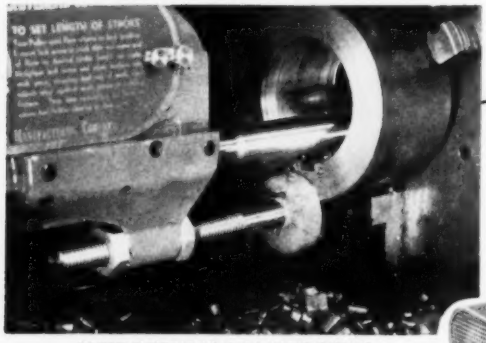
Step up PRODUCTION

ON YOUR

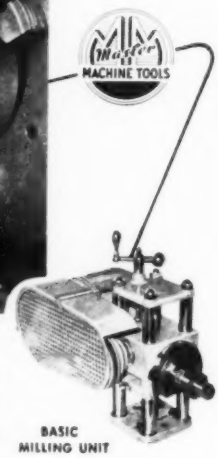
LATHE—TURRET—OR MILLING MACHINE

with **Master Machine Tool Attachments**

(MASTER LATHE CONVERTER)

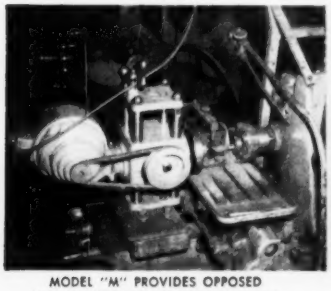


MASTER SLOTTING HEAD ON LATHE CUTTING ½" KEYWAY IN STEEL SLEEVE IN 4½ MINUTES

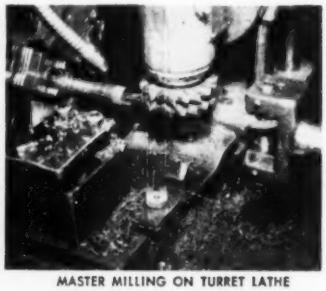


BASIC MILLING UNIT

The Master attachments can be used profitably on many production operations. The basic milling unit with the many types of precision heads gives you facilities for milling, grinding, boring, drilling, indexing, slotting, and keyseating. They are an outstanding value for general purpose use in maintenance, repair, tool room, and experimental shops, as well as production, thus providing equipment that performs a full range of shop operations at a minimum investment. Investigate this valuable shop tool, illustrated in new catalog. Three sizes: Model "C," ⅓ hp — 9" to 13" lathes; Model "B," ½ or ¾ hp — 13" to 18" lathes; Model "M," 1 or 1½ hp — 18" to 72" lathes.



MODEL "M" PROVIDES OPPOSED MILLING HEAD ON HORIZONTAL MILL



MASTER MILLING ON TURRET LATHE COMPLETING PART IN ONE SET-UP

WRITE FOR NEW ILLUSTRATED 24-PAGE CATALOG

MASTER MANUFACTURING CO.
1322 EAST AVENUE A
HUTCHINSON, KANSAS U. S. A.

ess for producing x-ray images, expected to provide a tool of considerable value in the inspection of ordnance and other war material.

• **Northrop Aircraft Corp.,** Los Angeles, will construct and equip 450,000 sq ft of additional manufacturing area under a $5,300,000 expansion program. The building program provides for tooling, foundry, assembly and test buildings, a hangar and for two large mezzanines in existing structures.

• **Ward Leonard Electric Co's** Industrial Chrome div., Mt. Vernon, N. Y., has appointed the following distributors: S. B. Poby Co., Rochester, N. Y. Syracuse Supply Co., Syracuse, N. Y.; and Logan Hardware & Supply Co., Huntington, W. Va.

• **Hansen Mfg. Co.,** Cleveland, has named Edward Burke of The Burke Co., San Francisco, distributor in northern California.

• **Taft-Peirce Mfg. Co.** has appointed J. L. Osgood Machinery & Tool Co. as representative in Buffalo and Rochester, N. Y. territory.

• **Wheelco Instrument Co.** has appointed Engineering Products Co., Charleston, W. Va., as district agent for West Virginia.

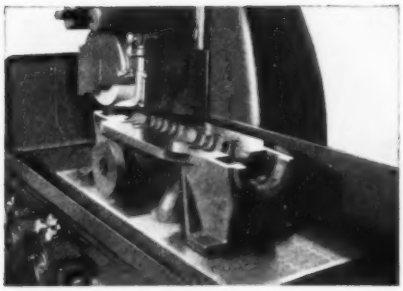
Ordnance Heads Transferred

CHICAGO—Col. Robert K. Haskell has been named chief of the Chicago Ordnance District, succeeding Col. S. R. Stribling, who is being transferred to the Augusta, Ga., arsenal. Col. Haskell has been stationed at the Watertown, Mass., arsenal for the past year.

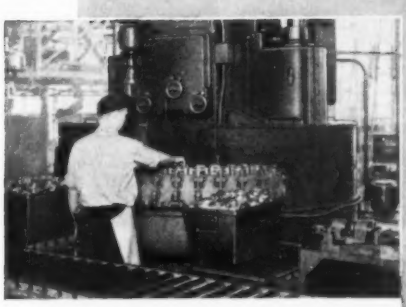
Mack Gets Big Truck Order

NEW YORK—Orders for U.S. Army military trucks and spare parts totaling $77,430,000 have been awarded Mack Mfg. Corp. by the Philadelphia Ordnance District. An original contract for $25 million, which is part of the above total, was awarded Mack in March this year. Involved are 6 x 6's, trucks and tractors, together with spare parts. The manufacturing end of the contract will be performed at the company's New Brunswick, N. J., plant, now devoted only wholly to defense output. Assembly will be at Mack's Allentown, Pa., plant.

WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.



40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.



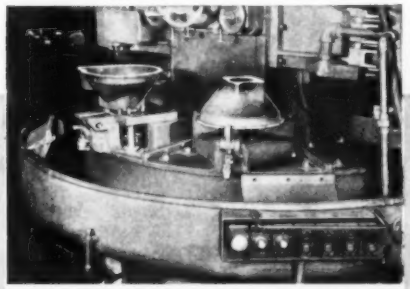
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

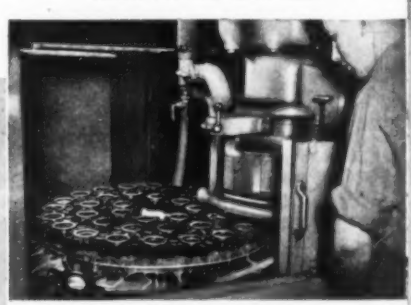
For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1½" thick — stock removal, each side .030". Production 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".



320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

Ceramic Coating Catches on — Ryan Aeronautical Co. claims the nation's first volume production contracts for ceramic coating of exhaust systems to conserve strategic alloys. Some 600 exhaust sets for Pratt & Whitney engines for Convair transports will be ceramic-coated. Boeing has ordered ceramic-coated Ryan exhaust assemblies for all its B-50 bombers and C-97 Stratofreighters. General Electric has given Ryan experimental orders for ceramic coating of J-47 transition liners and inner combustion chambers. And on the ground Continental Motors' 825-hp Patton tank engine will have ceramic-coated sections on the new manifolds.

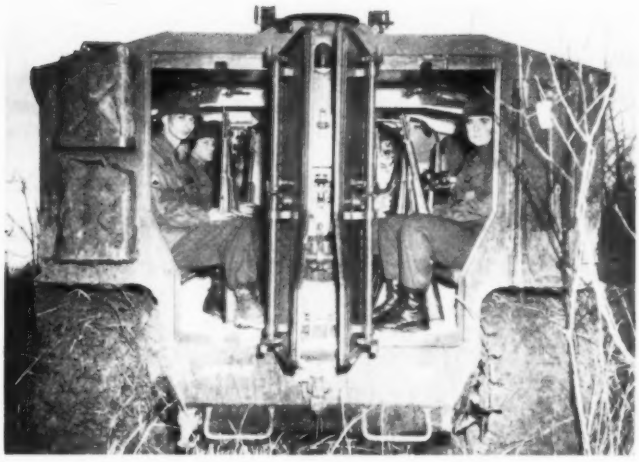
Kaisers Built in Israel — The first Kaiser automobiles produced at the newly completed plant of Kaiser-Frazer of Israel, Ltd., at Haifa have been shipped to Finland. The 45 units in the shipment were the first of 1000 K-F cars included in a Finnish-Israel trade agreement under which $4,500,000 in Israeli commodities are to be exported. The Israel plant has orders on hand for production through April, 1952. The plant, opened in June, assembles finished cars from parts shipped from the K-F main plant at Willow Run.

Europeans To Visit Metal Show— The Economic Cooperation Administration has set aside more than $500,000 to enable eleven groups of top metallurgists from Marshall Plan countries to attend the World Metallurgical Congress in Detroit, Oct. 14-19. Some 500 metal experts from 21 ECA and non-ECA nations will participate in the meeting. The Congress will run concurrently with the 33rd National Metals Exposition.

New-Type Combat Vehicles Produced in Record Time

WASHINGTON — Army Ordnance has launched production in record time on an entire new fleet of tank and combat vehicles of postwar design. Delivery of the production model of a new light tank within seven months after placement of the contract is an example of progress being made on the program.

At a cost of $5,362,574,308 such

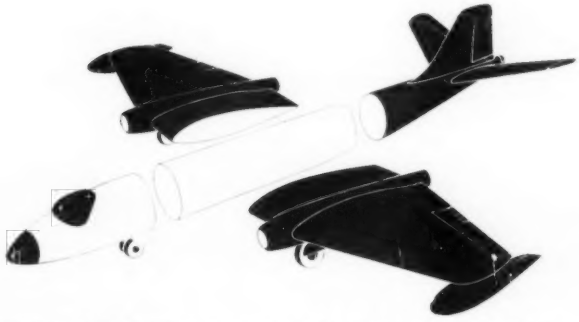


New armored personnel carrier takes infantrymen to front lines along with tanks, yet affords protection from small arms fire and shell fragments. Designated the T18E1, the 20-ton vehicle is designed to carry a squad of 12 men. Double rear doors permit the squad to dismount quickly

items as tanks and allied combat vehicles, military type trucks and trailers, commercial type sedans and trucks, and spare parts, tools and equipment for these vehicles were procured for the Army, Navy, Air Force, civilian components of the Army, and the Mutual Defense Assistance and other foreign aid programs.

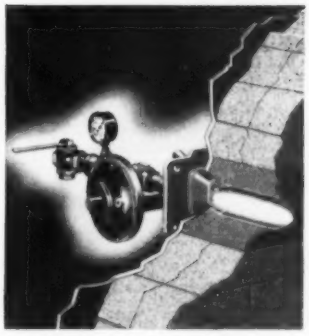
• **To expedite tank** and automotive production, the largest portion of the procurement program, Ordnance has authorized its field procuring installations to issue letter order contracts up to 50% of the total estimated contract price and to execute definitive contracts up to an amount of $10 million without submission to Washington. This procedure has enabled manufacturers of long lead-time items, such as tanks and combat vehicles, to begin production without delay. An estimated 4 to 6 months has been saved by this means.

An important factor in expediting production has been establishment of three procurement centers: the Ordnance Tank-Automotive Center in Detroit, with authority to direct the procurement of tank and automotive equipment on a nation-wide basis; the Ordnance Ammunition Center at Joliet, Ill., the wartime nerve center of the whole ammunition procurement activity; and the Ordnance Small Arms Ammunition Center at St. Louis, the most recently established of the three.



Portions of B57A Canberra shown in black will be subcontracted. This will amount to about 60% of the aircraft by weight. Martin will build a night intruder version of the British-designed twin-jet for the U. S. Air Force

Valuable **Information on Burner Equipment**



Over 60 types and 600 sizes for ALL Industrial Heating Operations

Check type of equipment of interest to you or indicate heating operation involved and we will send you technical literature covering appropriate equipment.

- ☐ Low pressure gas systems
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(Heating Operation)

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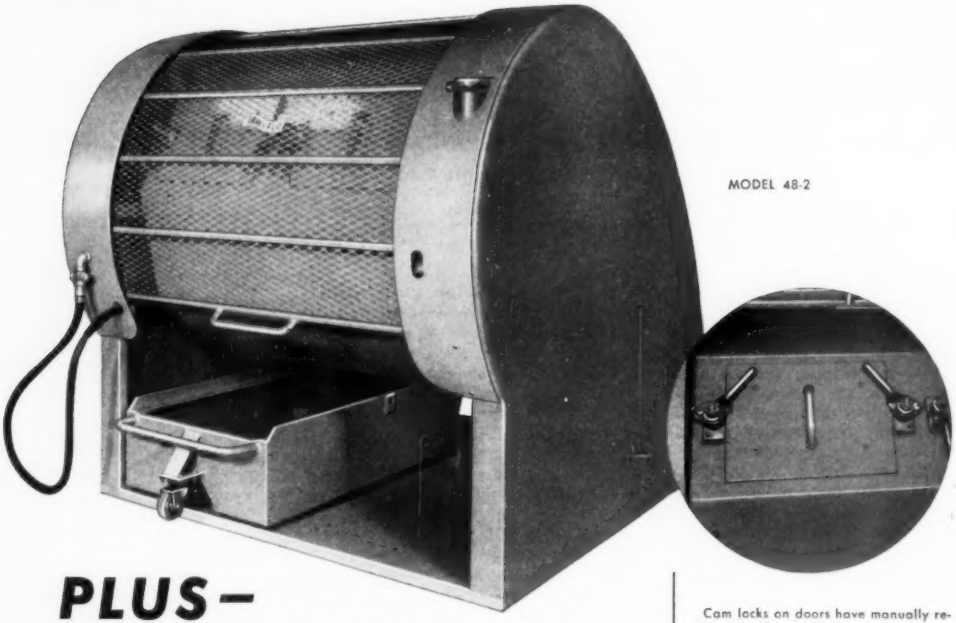
Industrial Burners and Furnaces

Surface Combustion Corporation
Toledo 1, Ohio

31% to 80% MORE WORK-LOAD-

than comparable tumbling machines occupying the same floor space!



MODEL 48-2

PLUS—

a 15% to 25% shorter cutting cycle!

Grav-i-Flo Tumbling Machines are designed to produce more work in less floor space. That's why so many companies have chosen Grav-i-Flo to handle all their tumbling needs. These manufacturers have compared Grav-i-Flo to other tumbling machinery and have found—First: that Grav-i-Flo machines, in each model, occupying the same floor space, have a 31% to 80% greater capacity; Second: that Grav-i-Flo machines cut from 15% to 25% faster; Third: this shortened processing cycle permits reduction in the required number of machines for an installation, thus benefiting capital investment, floor space and production time; and, Fourth: Grav-i-Flo tumbling machines in all models have such exclusive features as advanced design on door locks and safety guards, and cylinder removal for easier maintenance.

Cam locks on doors have manually released safety stops for pressure relief.

New Grav-i-Flo machines available in a number of models to meet all tumbling requirements. Compartments furnished ½" plate unlined or ¼" plate rubber lined. Reduced voltage control on magnetic starter. Lever or push-button switch. Limit switch on safety guard. 220-440 volt, 3 phase, 60 cycle motor with magnetic brake. Water attachment with hose. Counterbalanced safety guard. Hoist pan has tubular yoke with manually operated lock.

TUMBLE GRAV-I-FLO FINISH

Motor Driven Separator—welded frame supports hoist pan. Separating screen, adjustable from 0" to 1½", accomodates various sizes and types of parts. Screen inclined 5° maximum. Pan shelf provided for stock pan. 1 H.P., 220-440 volt, 3 phase, 60 cycle motor with speed reducer, and manual starter with overload protection.

Samples Processed Free! The Grav-i-Flo Sample Processing Department will gladly tell you how to attain a better finish at lower costs. Send samples direct to The Grav-i-Flo Corporation.

THE GRAV-I-FLO CORPORATION

Dept. AM-9, 400 Norwood Ave., Sturgis, Michigan

Extra Savings in Design and Production . . . with *Mallory High-Density Alloy!*

The list grows every day! Mallory non-ferrous alloys and ingenious applications are making big savings for more and more Mallory customers.

Here's an interesting example. Recently, a well-known manufacturer of aircraft instruments was faced with the necessity of increasing the stability of a gyroscope, in order to use it for larger planes. Plans included enlargement of the steel rotor . . . involved expensive re-tooling for the larger assembly. Mallory suggested that the rotor be made from readily-machinable, high-density Mallory 1000 Metal. Tests proved it to be ideal. The required stability was obtained with no increase in the size of the rotor or the gyroscope. Further . . . production delays and the expense of major re-designing were avoided.

That's service beyond the sale!

And whether your problem is metallurgical or electronic, what Mallory has done for others can be done for you!

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

Mallory 1000

Mallory 1000 is a high-density metal whose density approaches that of pure tungsten, platinum and gold. It has great strength and is readily machinable. Its resistance to the corrosive action of many acids, as well as the atmosphere, is superior.

Mallory 1000 is ideal for uses where maximum weight in minimum space is required, such as gyroscope rotors, balance weights on crankshafts, variable-pitch propellers and centrifugal clutches. Its great density also makes it useful for shielding X-ray and gamma radiation.

As a leading producer of unusual alloys and materials from copper, silver, platinum, palladium, tungsten, molybdenum, aluminum-bronze, and nickel, Mallory is in a qualified position to make effective and impartial recommendations for materials best suited to your needs. Write today.

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PRESSING ...

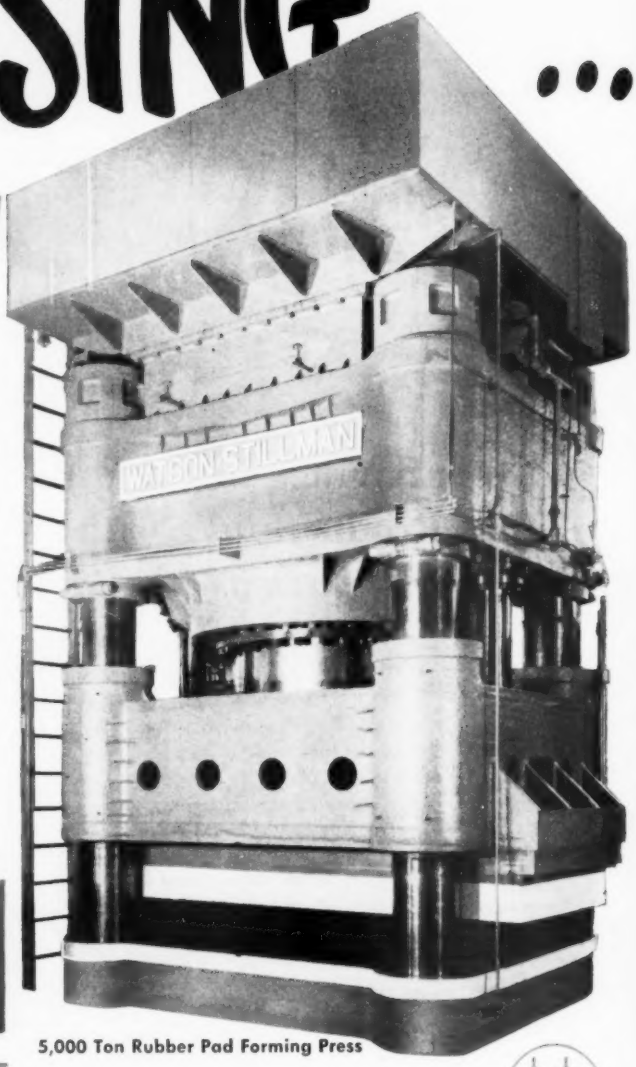
out the ARMS for UNCLE SAM!

Planes . . . tanks . . . guns . . . shells . . . shell cases or any one of a thousand and one other items that must be produced, as long as it can be pressed out of metal, there's a W-S Press to do the job . . . and more economically, too.

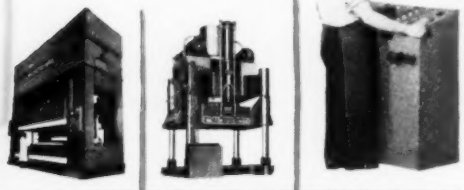
W-S Medium and Deep Draw Presses do things faster. Rejects are virtually eliminated . . . present dies and materials can be used . . . one or more draws may be cut from a progressive operation, thereby saving man hours on the job . . . intermediate annealing is often reduced or eliminated and total production time cut down.

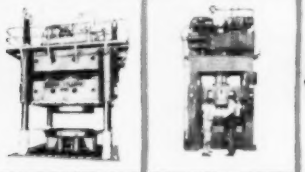
Designed for precision work and built for long service, these W-S Hydraulic Presses offer further advantages in set-up, maintenance and tool life. Available in a large choice of pumping units and controls. It will pay you to investigate their flexibility.

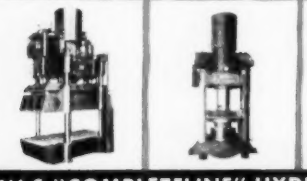
Other W-S Metal Working Presses include those for Forming, Flanging, Trimming, Forging, Coining, Hobbing, Extruding, Briquetting, Bending and Straightening.



5,000 Ton Rubber Pad Forming Press







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Branch Office: 228 No. La Salle St., Chicago, Illinois

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Denver 2, Colo. . . . . Overgard Machine Tool Co.
Indianapolis 20, Ind. . W. K. Millholland Mach. Co.
Los Angeles 11, Cal. . . . . H. M. Royal, Inc.
Pittsburgh 19, Pa. . . . . Stanley Berg & Co.
Portland, Ore. . . . . Machinery & Tool Supply Co.
Rochester 12, N. Y. . . . . Watson-Stillman Co.
San Francisco 7, Cal. . . Schellenbach Mach. Tool Co.
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W-S "COMPLETELINE" HYDRAULICS . . . THE SHORTEST DISTANCE FROM PRODUCTION TO PROFITS

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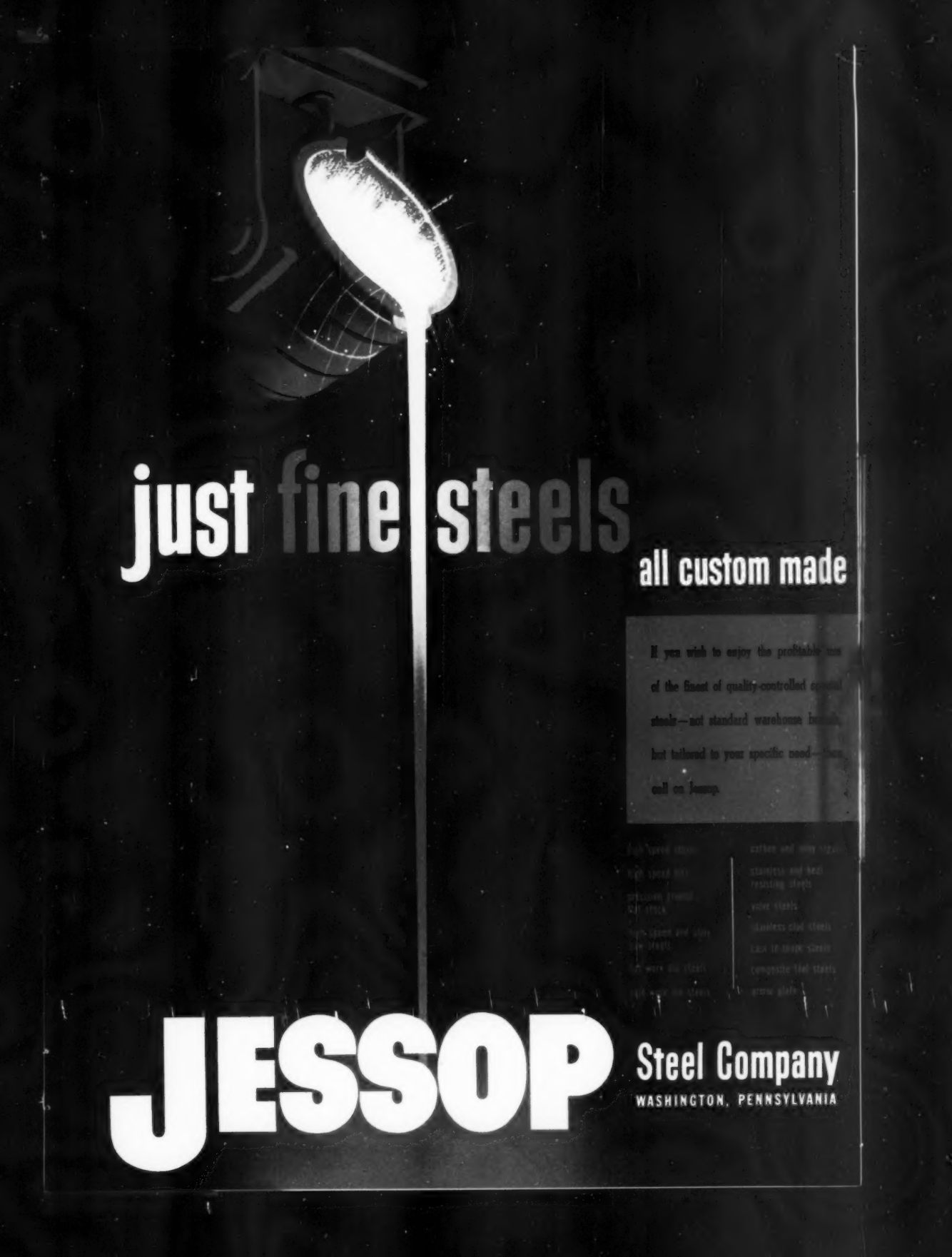
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Out of this unique "forging laboratory" have come many significant advancements . . . the high speed forging press . . . modern horizontal Forging Machine . . . blank-preforming Reduceroll . . . Semi-Hot Rivet Header . . . Boltmaker . . . roll-over transfer Cold Nut Former . . . Automatic Precision Nut Tapper . . . Nail-Maker . . . Cold Headers for bearing rollers and balls, for tubular and solid rivets, and thousands of other parts . . .

In addition, we've been continually developing new forging applications and methods right along . . . establishing basic principles of die design as influenced by metal flow, both hot and cold . . . upsetting . . . deep piercing . . . extrusion . . .

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Hartford Detroit Chicago

Hear about the revolution in Cleveland?

Rolling out of Cleveland these days is a revolution in armored warfare.

It's the T-41 "Walker Bulldog"—the first U.S. tank to be built *around a gun* instead of an engine.

But the T-41 is involved in a *production* revolution, too! Though assembled in Cleveland, its actual parts and materials come from *two thousand* factories . . . in nearly every state!

This "production team" system is producing miracles. But it produces new timing problems, too. How do you bring in two thousand units . . . at the right time?

These production experts know the answer. When they want parts and materials fast, they use the service that *gets there first.* They use Air Express!

Whatever your business, Air Express speed can make your deadlines, increase your profits. Here's why!

IT'S FASTEST—Air Express gives the fastest, most complete door-to-door pick-up and delivery service in all cities and principal towns, *at no extra cost.*

IT'S MORE CONVENIENT—One call to Air Express Division of the Railway Express Agency arranges everything.

IT'S DEPENDABLE—Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

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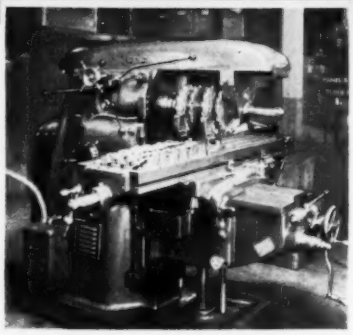
AIR EXPRESS

GETS THERE FIRST

Here's how NELCO Carbide Tipped Tools increased Production on this Chilled Iron Casting OVER 60%!



Facing 4 surfaces of Chilled Iron Refrigerator Door Hinge on #3 Cincinnati milling machine — High Speed Steel Cutter vs. Nelco Carbide Cutter.

HIGH SPEED STEEL

Production — 50 pieces per hour.
Cutters needed frequent repairs.
Down-time increased production cost.
Rejected pieces were excessive due to chilled condition and hard spots in castings.

NELCO CARBIDE CUTTER

Production — 80 pieces per hour.
Resulted in continuous operating time and no rejected pieces.
Production increased more than 60%!

OBJECT: SAVINGS—When you change to Carbide Tipped Tools!

Chilled Iron, Steel, Brass, Bronze, Aluminum, or Alloys can be milled faster, better, more efficiently with Carbide Tipped Tools. There is a NELCO Cutter, Face Mill, Slab Mill to increase your production — cut your costs.

Remember: NELCO Tools are designed with nickel shim brazed carbide tips and alloy steel bodies. Investigate the many other NELCO exclusive advantages. Learn how your production costs can come tumbling down.

WRITE FOR CATALOG and name of your NELCO distributor.

NELCO TOOLS

For that Extra Edge in Production

NELCO TOOL CO., INC. MANCHESTER, CONNECTICUT

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RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

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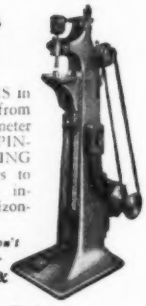

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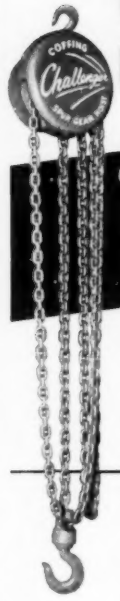
Coffing Challenger



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Carry it with one hand. One-ton model, with coil chain for standard lift of 8 ft., weighs only 38 lb.

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Use it year after year. Long life is built in . . . sealed in. Housing is formed steel plate—will not crack under sudden shock loads. Back plate is laminated for extra rigidity. Hoist mechanism has sealed-in lubricant.

Safe

Trust it to protect men and equipment. Tested at 100 percent overload. All load-holding parts are special alloy steel. This hoist actually has a five-to-one safety factor.

Economical

Service it yourself. The Challenger may be completely disassembled in minutes with simple tools. No lost travel time to and from the factory for repairs.

Find out more about the all-new Coffing Challenger, available in ½- and 1-ton capacities. Write for Bulletin AM9C

COFFING HOIST COMPANY
Danville, Illinois

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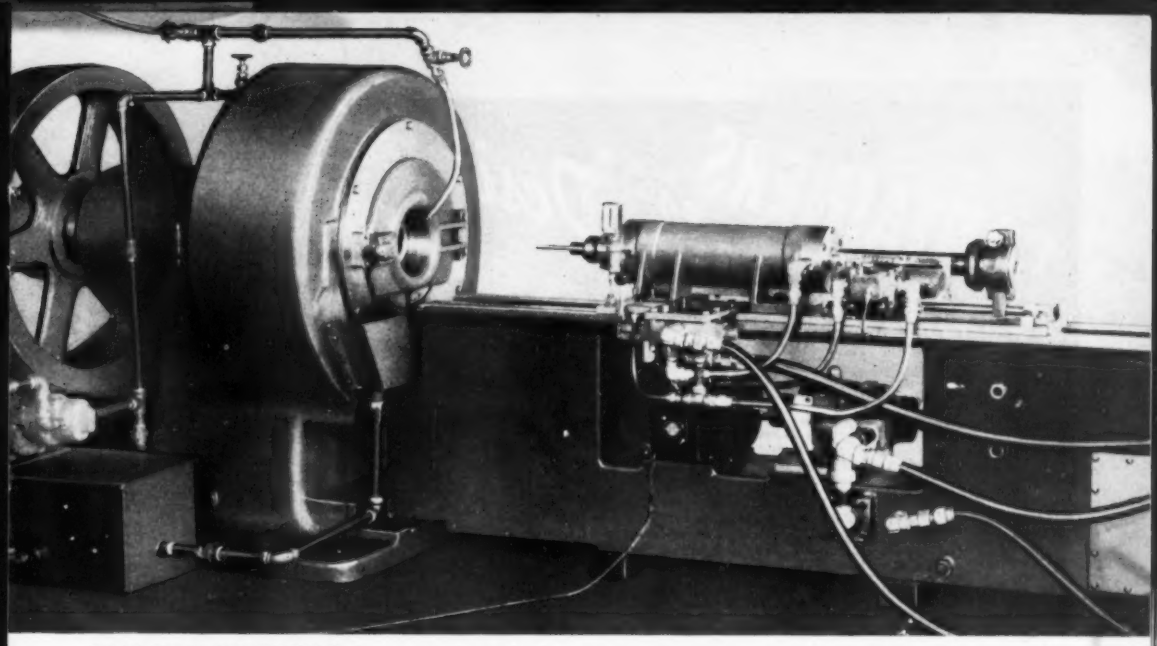


FENN SWAGING MACHINE, featuring hydraulic feed, automatic chucking, and oil-cooled dies, is fast replacing lathes and screw machines for shaping a wide range of metal parts because it . . .

MAKES METAL GO TWICE AS FAR

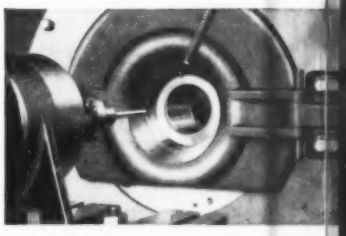
Yes, you can cut your metal requirements in half, in many cases, with this Fenn Swaging Machine. That's because it doubles the length of the blanks it shapes . . . with absolutely no stock removal.

MANY OTHER ADVANTAGES

What's more, this Fenn Swager produces a denser structure in metal parts . . . maintains concentricity . . . gives an improved finish . . . requiring no subsequent grinding . . . calls for less operator skill than any other machine capable of producing equivalent parts.

WRITE FOR SPECIFICATIONS

It will pay you to investigate all the cost-cutting, material-saving advantages of the Fenn Swager. Contact the Fenn distributor nearest you for facts and delivery schedules, or write direct to THE FENN MANUFACTURING COMPANY, 1859 Broad St., Hartford 1, Conn.



SIMPLE DIE CHANGES, using blanks in various diameters, make Fenn Swaging Machines quickly and easily adaptable to a wide variety of jobs. You can use them for reducing, pointing, or forming bar stock or tubing. Also for assembling fittings to cables. Fenn Swagers and Hydro-Formers come in sizes and designs for every swaging need.

FENN

Shaping metal for better and stronger products at lower cost

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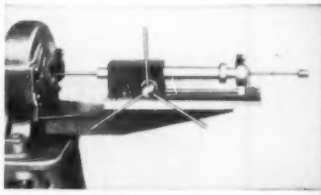

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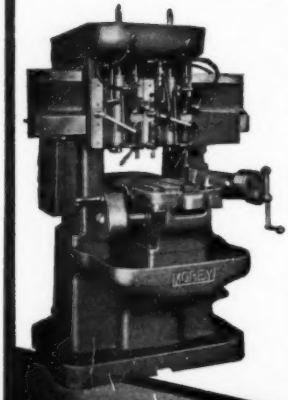

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1 FACE PIECE— 7 CARTRIDGES

(Quickly Interchangeable)

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WITH THE AO R2000 RESPIRATOR

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- ½" rubber headband.
- Inhalation valve of pure gum rubber freely admits air at lightest intake of breath, seals tightly on exhalation.
- Exhalation valve cannot stick, completely expels air—moisture cannot collect, dust cannot enter.
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Your nearest AO Safety Products Representative can supply you

American Optical COMPANY
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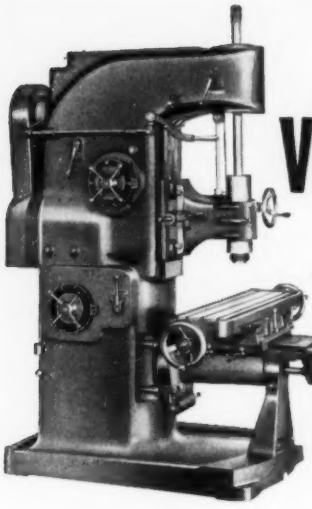

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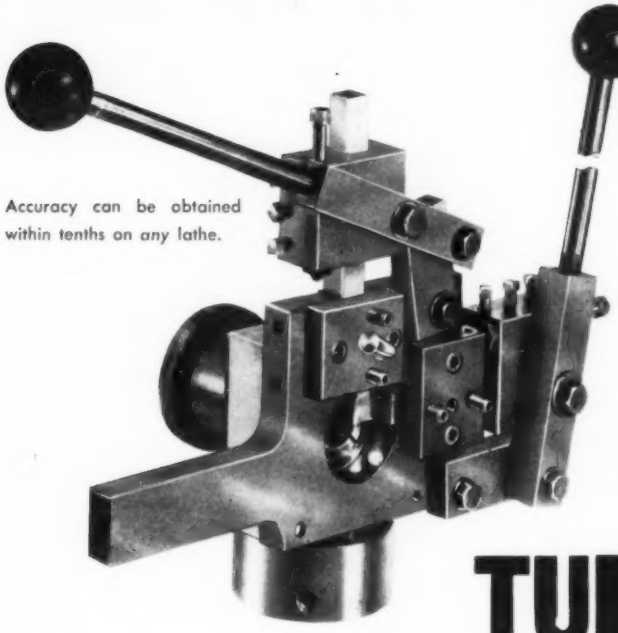

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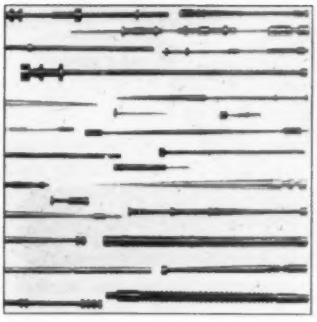

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Grinds cover rim in 5 seconds ...far faster than milling!

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Previously, aluminum cover shown above was loaded in fixture, then faced on milling machine.

Now, rim is ground flat, by hand presentation, on Porter-Cable Model BG8 Abrasive Belt Machine. No fixture necessary. Surfacing time, including handling: 5 seconds.

Abrasive Belt Machining removes stock rapidly, provides fine finish free of tool marks. Greatly simplifies fixtures—or eliminates them entirely. Is often 10 times faster than milling, shaping or ordinary grinding—frequently saves 75 to 90% of former set-up time.

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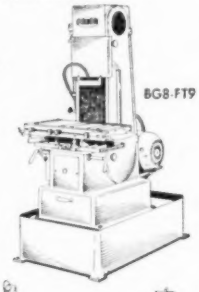
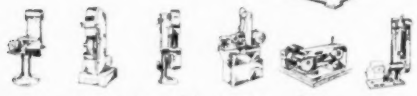
MODEL BG8-FT9 (with automatic feed table). For precision surfacing on repeat operations. 8"-wide belt works entire areas at once. Quickest method on interrupted surfaces.



BG8-FT9

Abrasive Belt Machines for Every Application



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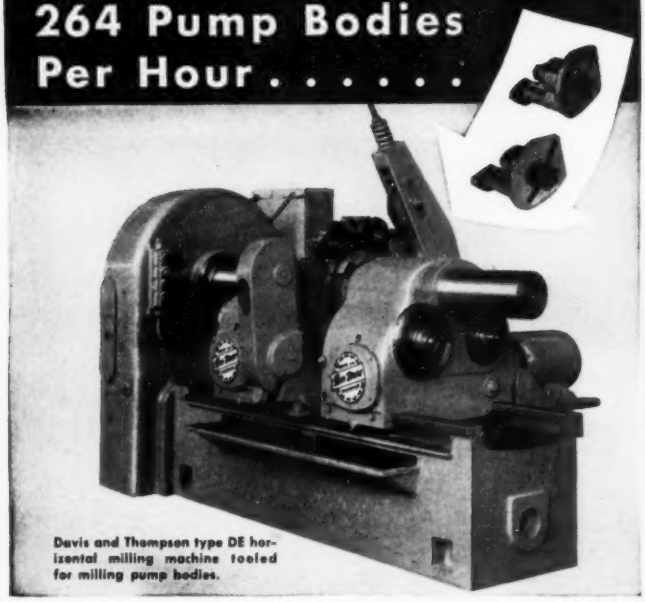

Davis and Thompson type DE horizontal milling machine tooled for milling pump bodies.

1-A Standard Horizontal Milling Machine

Oil pump bodies requiring high degree of finish and high production are rough and finish milled on both sides simultaneously with this Davis and Thompson type DE milling machine. Production is 264 pieces per hour.

Patented Angular Spindle Adjustment Allows "Toe Cutting"—Maintains Fine Finish at High Production

The finishing spindle is provided with an exclusive D&T design which allows angular adjustment. This in turn results in "toe-cutting" and eliminates "drag" of the cutter over the finished surface. Both roughing and finishing spindles have micrometer endwise adjustment.

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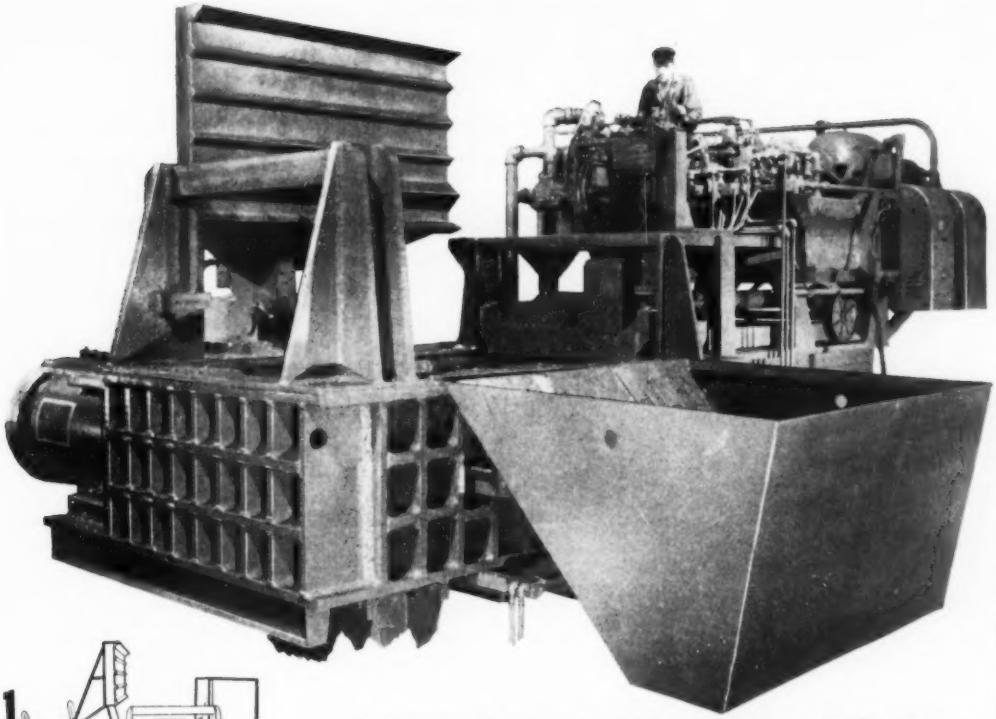
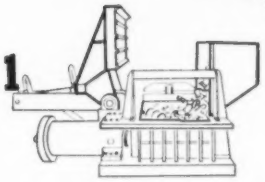
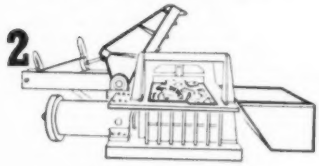
DO you know just what you have in material and equipment inventories? If you don't, you'll drop more dollars than you think. It isn't necessary to know how many peanuts there are in the barrel (as one store clerk attempted to discover) but you must know how many barrels, and how rapidly one is used up.





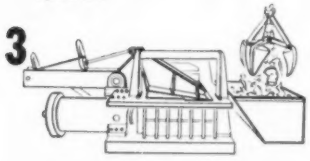
1

Skip-Pan Loader dumps scrap metal into charging box. Auxiliary Compression Door is in "up" position ready for immediate action once operator touches hydraulic controls.



2

Skip-Pan returns to loading position as Auxiliary Compression Door begins its "one stroke" compressing operation.



3

Door compresses scrap, permitting charging box door to be closed without further arranging. During baling cycle Skip-Pan is reloaded and charge dumped into box as soon as bale is ejected.

★ Users Report—"Dempster-Balesters Turn Out 25% Greater Tonnage With Auxiliary Compression Door" . . .

The high-speed Model "600" Dempster-Balester, shown above, produces bales at the rate of 6 to 7½ tons per hour. With Auxiliary Compression Door, which users report increases the 6 to 7½ ton rate by a conservative 25%, this Dempster-Balester is making scrap metal baling more profitable than ever before! With its simple construction and two ram design, this big capacity press is easy to install . . . economical to operate. The hydraulically operated Auxiliary Compression Door compresses heaped scrap into the charging box with a 45-ton force. The hydraulically actuated Skip-Pan Loader, another cost-cutter, is standard equipment on all models. This invaluable feature permits preparation of a new full charge while press is baling. Illustrated at left, is the 1-2-3 production punch of a Dempster-Balester with Auxiliary Compression Door and Skip-Pan Loader. Write today for completely illustrated folders on the Dempster-Balesters, Models "600," "275," and "128." All are products of Dempster Brothers, Inc.

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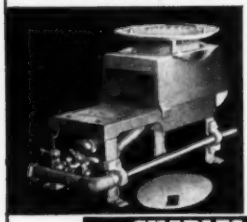

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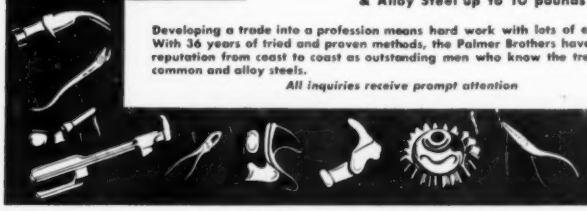

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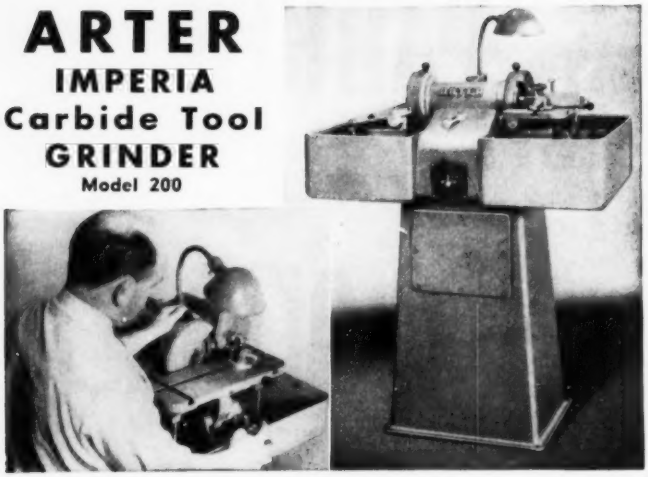

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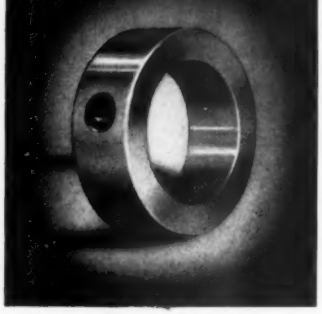

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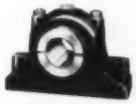

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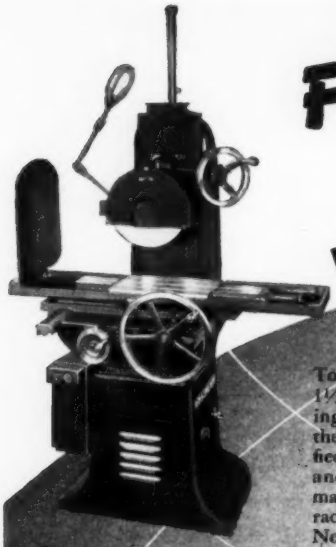

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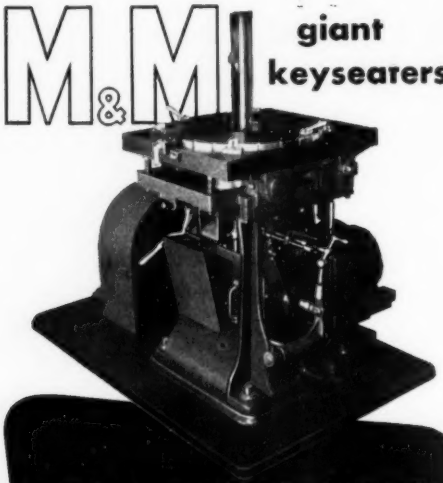

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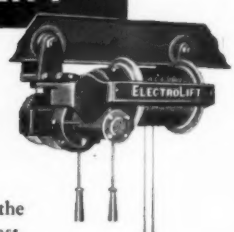

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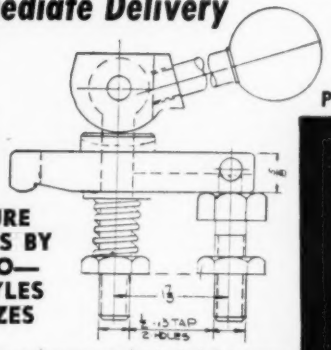

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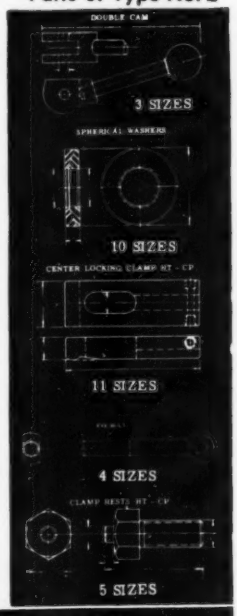

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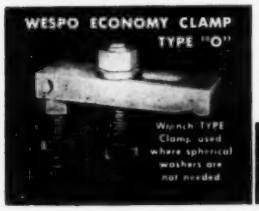

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WHAT you say and what you write must agree. You can't post a memorandum that lays down a policy, then nullify it by word of mouth—and vice versa. If you do, the least criticism you'll get is that you're changeable-minded. And charges that you're two-faced and a liar are more likely.

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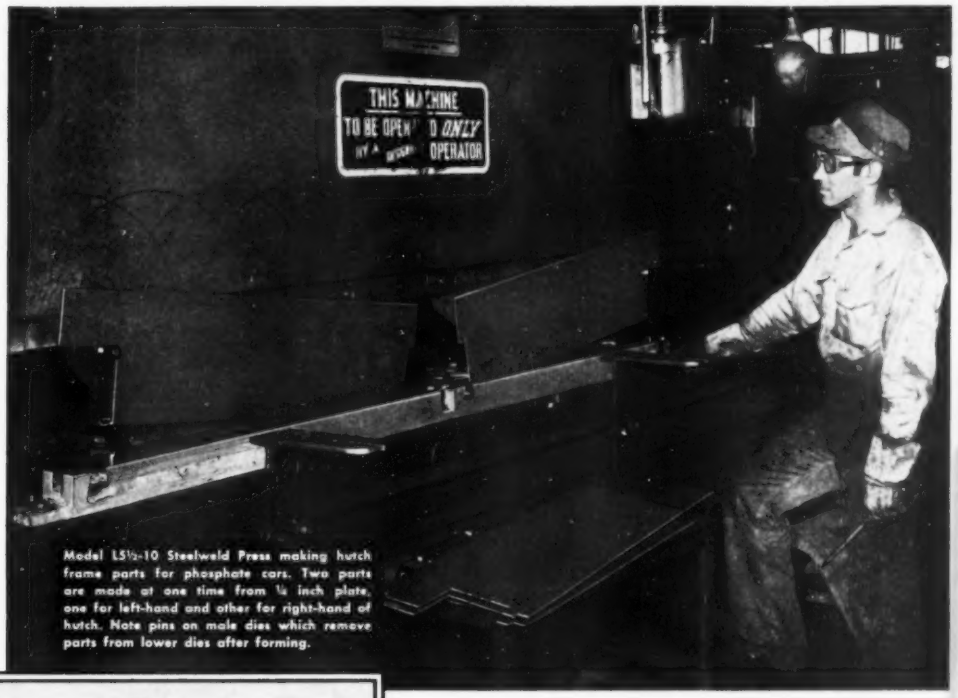

Model LS½-10 Steelweld Press making hutch frame parts for phosphate cars. Two parts are made at one time from ¼ inch plate, one for left-hand and other for right-hand of hutch. Note pins on male dies which remove parts from lower dies after forming.

A few of the many parts produced within a short period on the Steelweld Press. Curves and bends of every shape and degree are formed quickly and accurately.

"The more we use our Steelweld Bending Press, the more we learn about what it can do for us", said the Day Superintendent of Pullman-Standard Car Mfg. Co., Butler, Penna. "As a result it is handling more and more of our work. We are doing a great many forming jobs on it that did not occur to us as being possible when we first installed the machine."

An endless variety of parts are produced on this press. These are mostly of ¼ and ⅜ inch steel plate and involve curves and bends of every description for gussets, fulcrums, braces, frames, housings, etc. used in the manufacture of railroad cars.

The dies used are relatively simple and made in the company's shop. Because dies are easily changed, it usually takes about an hour to set up for a new job.

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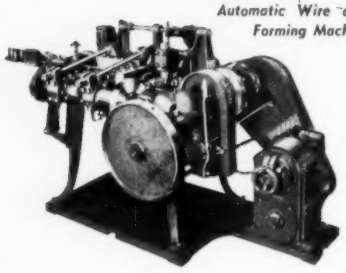

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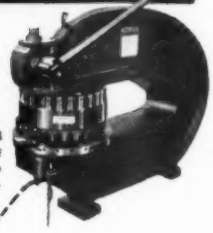

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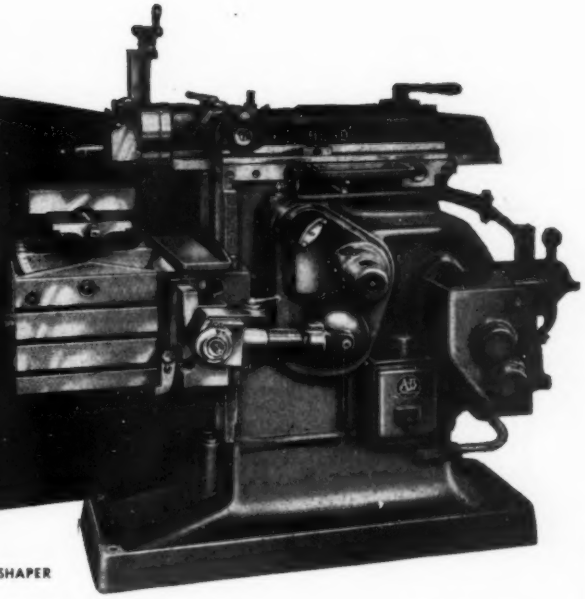

1951

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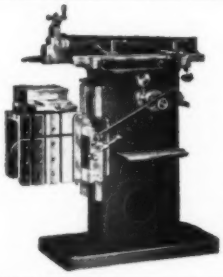

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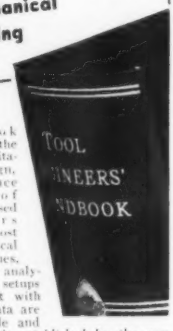

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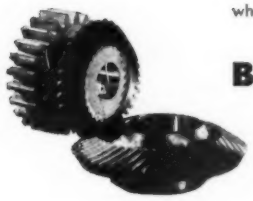

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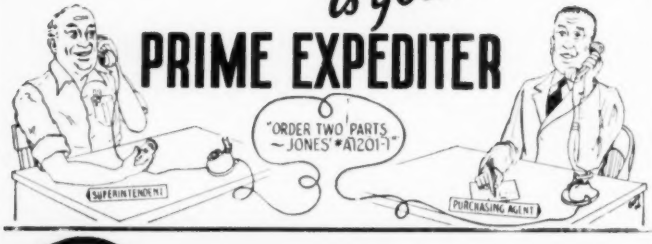

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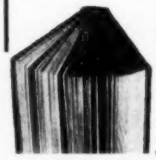

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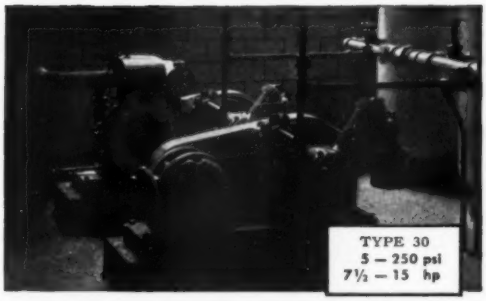

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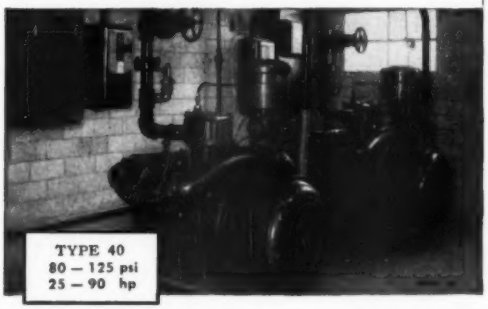

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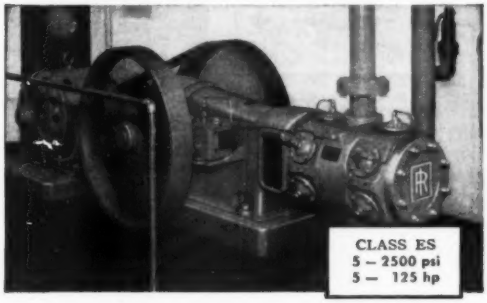

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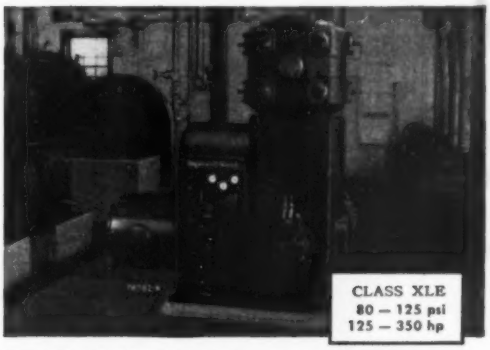

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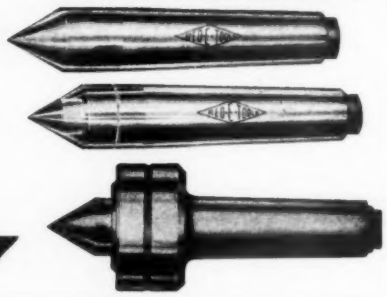

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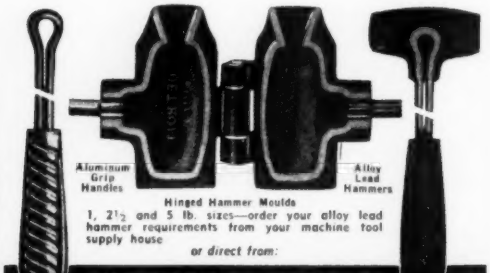

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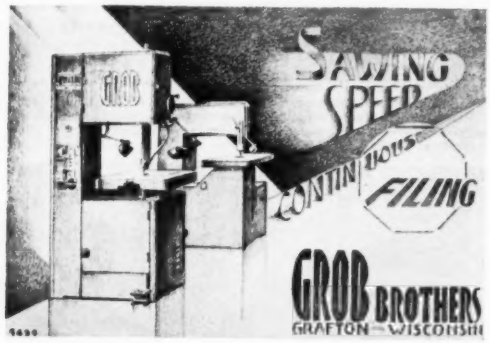

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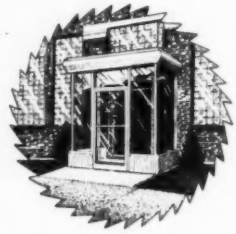

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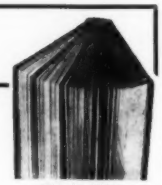

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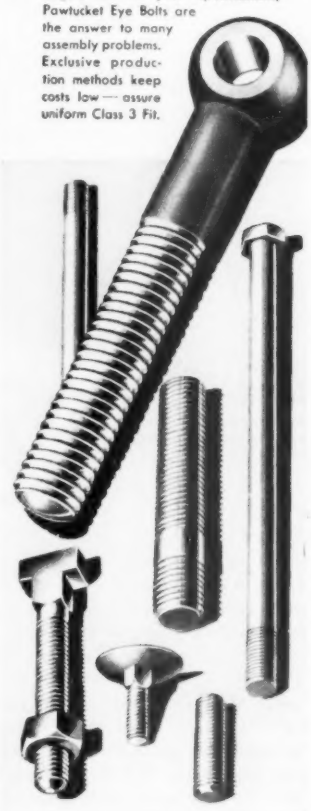

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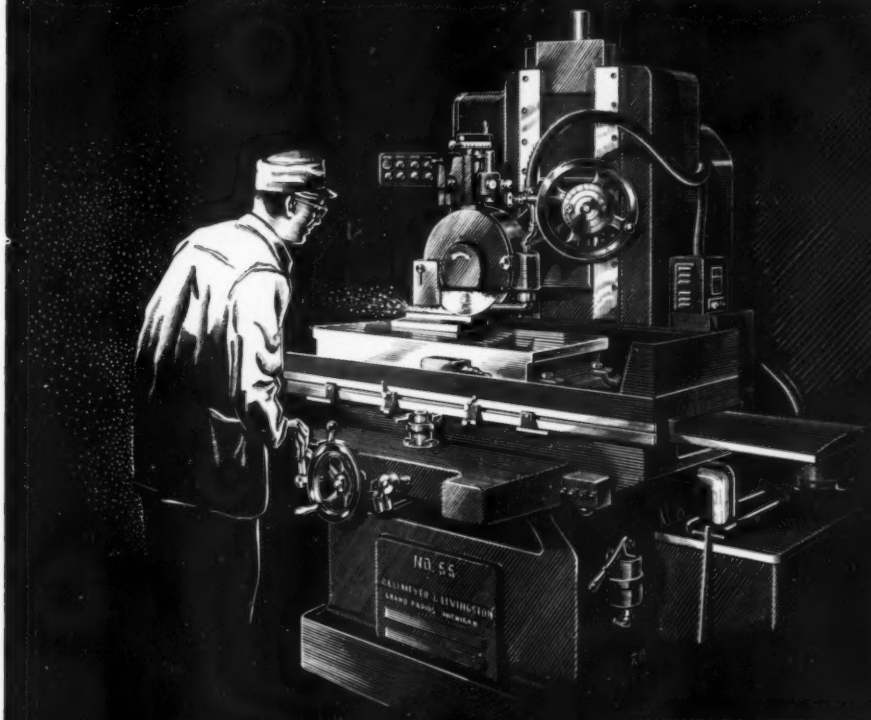

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YOU WRITE THE SPECIFICATIONS

Our job is to furnish Adams Gears exactly as you want them. Highest quality is assured through close control over every detail of manufacture. The Adams Company, 1942 Cypress Street, Dubuque, Iowa

the ADAMS line . . .

SPUR GEARS	INTERNAL GEARS (Spur and Helical)	SHAVED TOOTH GEARS (Spur and Helical)
BEVEL AND MITER GEARS	RATCHETS	GROUND THREAD WORMS
WORMS AND WORM GEARS	SPLINED SHAFTS	RACKS
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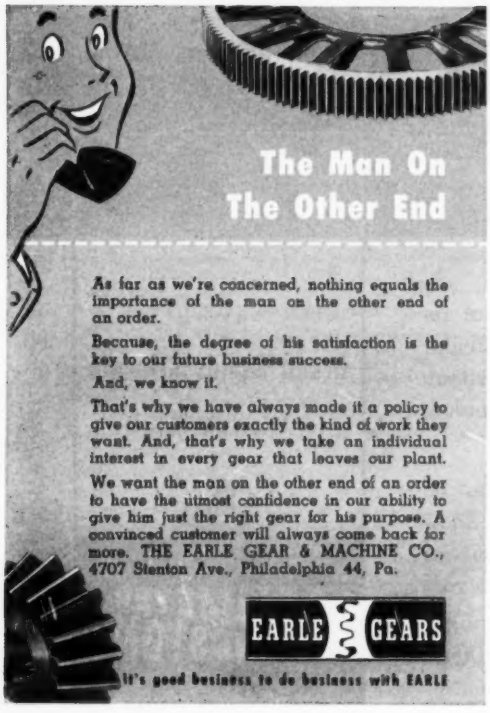
Dubuque, Iowa, U. S. A.
ESTABLISHED 1882

FINE GEARS MADE TO YOUR SPECIFICATIONS

GEARS



The Man On The Other End

As far as we're concerned, nothing equals the importance of the man on the other end of an order.

Because, the degree of his satisfaction is the key to our future business success.

And, we know it.

That's why we have always made it a policy to give our customers exactly the kind of work they want. And, that's why we take an individual interest in every gear that leaves our plant.

We want the man on the other end of an order to have the utmost confidence in our ability to give him just the right gear for his purpose. A convinced customer will always come back for more. THE EARLE GEAR & MACHINE CO., 4707 Stenton Ave., Philadelphia 44, Pa.

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It's good business to do business with EARLE

HEAT TREATING EQUIPMENT
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REG. U.S. PAT. OFF.

According to worker supply forecasts, your assembly lines will soon be "manned" by more and more housewives.

Whether housewives or not, any "green hands" on Socket Screw assembly jobs will learn faster and work faster with P-K* Size-Marked Gear Grip Socket Head Cap Screws.

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No wonder these time-saving, top quality Socket Screws are wanted, in tremendous quantities, for more of industry's finest products than ever before. P-K production is going 'round-the-clock to meet this mounting demand. For D.O. or other assemblies set your standards by P-K quality. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y. Sold through Accredited Distributors.

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The New
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A pocket-size plastic slide chart gives you all essential dimensions of P-K Socket Cap Screws, Set Screws, Flat Head Screws, Stripper Bolts, and Pipe Plugs. Includes Set Screw Point Dimensions, and Thread Length Formula. Available, FREE from your P-K Distributor.

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SIZE-MARKED SOCKET HEAD CAP SCREWS • GROUND THREAD SOCKET SET SCREWS
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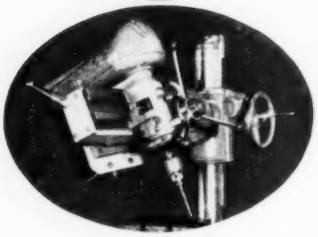
SENSITIVE UNIVERSAL BENCH RADIAL DRILL PRESS

Drills at ANY angle or position of arm



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Tilts to any angle up to 90° in either position

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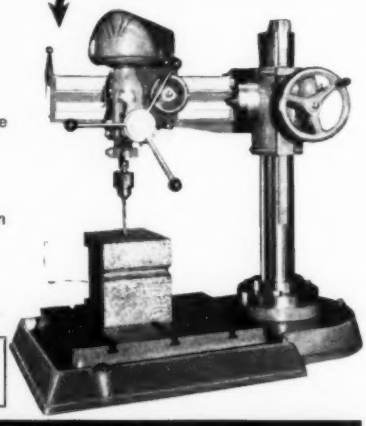

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The exceptionally wide ranges of power cross feeds, power longitudinal feeds, thread cutting feeds and power turret feeds provide combinations that permit maximum cutting speeds through the entire machining cycle. Machine handling is fast and easy as excessive mass is not present in carriage and ram assemblies. Write for Catalog 67-F for complete information.

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MAXIMUM COLLET CAPACITY . . . . 1"
With handlever collet chuck.

SPINDLE BORE . . . . . 1⅜"

SPINDLE SPEEDS—Twelve with 2-speed motor . . . . . 20 to 945 r.p.m.

SWING—over bed . . . . . 16¼"
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CROSS SLIDE FEEDS—48 in or out . . . . . .0006" to .0315"

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7' bed . . . . . 34½"

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TURRET TO SPINDLE DISTANCES—Maximum with 6' bed . . . . . 28¼"
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TURRET TOOL FEED . . . . . 6⅛"

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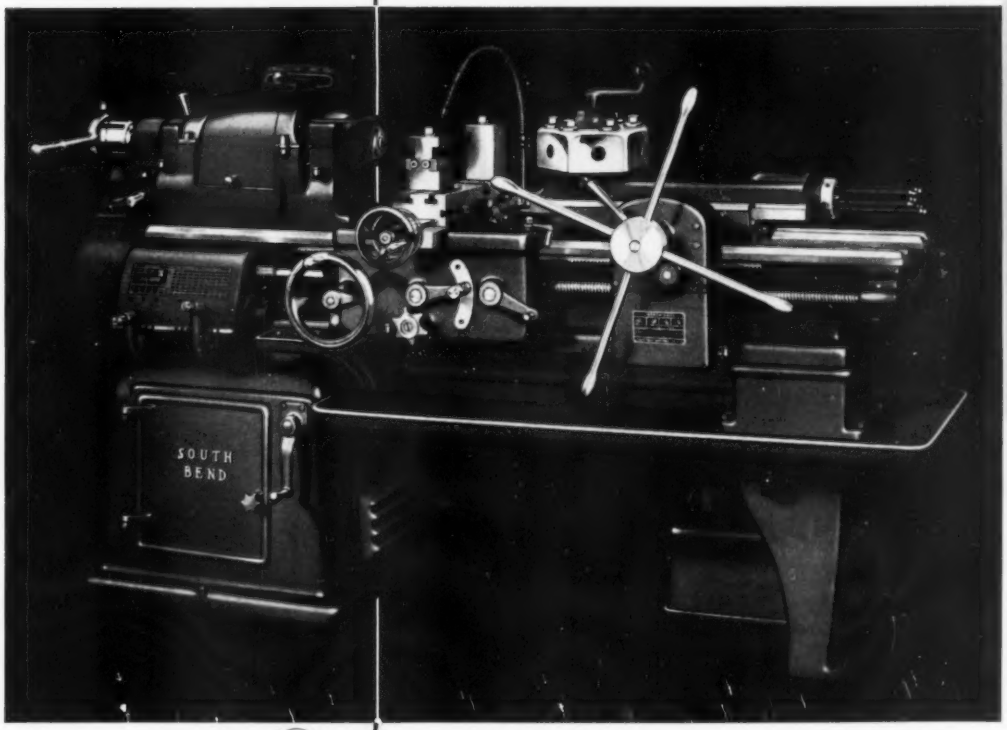
TURRET DIAMETER . . . . . 9¾"
between flats.

TURRET TOOL HOLES . . . . dia. 1½"
center to top of slides. . . . . 2½"



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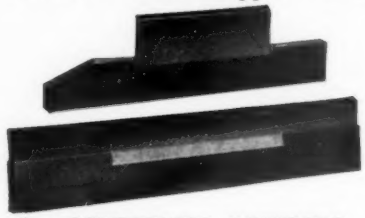
CARBIDE TIPPED...Work Support Blade



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Standard thrufeed and infeed work support blades available from stock. Prices on special blades quoted on receipt of prints. Worn blades salvaged—retipped and reground.

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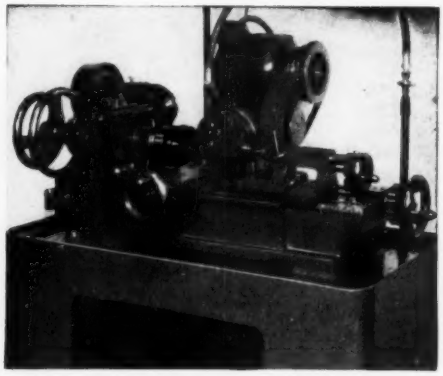

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...for producing accurate, fine-finish threads on small diameters at low cost

This NEW model is mounted on a welded steel base in which are accessibly located control panel, coolant motor and pump. It is equipped with separate motors for cutter, work and coolant. Motor push buttons are conveniently placed.

Swing over carriage is 3" and work 2" diameter or smaller can be handled. Threads 8¾" long can be cut with work held on centers. Special attachments are available for extending the utility of this machine. *Illustrated literature available on request.*

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Walker Magnetic Chucks Hold Everything

For more than sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

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This manufacturer faced a problem that's common to many plants today. His ten machines have 560 bearings—560 bearings that must be kept lubricated if production is to be kept uniform, rejects few. That lubrication job was taking four man hours every week and, because of human fallibility, there was always the potential danger that one of these many bearings had been overlooked or under lubricated.

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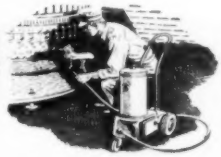

3. In applying lubricants . . . saves up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

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We'll include facts on the new Alemite Oil-Mist System, too—(OIL-MIST atomizes oil into mist, circulates it to bearings under pressure. Increases life of bearings as much as 17½ times).

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Never before A TAPPING MACHINE WITH ALL THESE ADVANTAGES

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FOOT OR AIR OPERATED 72A TAPPING MACHINE

Here is a fast, versatile foot or air operated tapping machine that puts high production precision tapping within easy reach of all manufacturers. Here's what it offers —

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YOU SHOULD USE CHICAGO "Safety Plus" Screws in Standard Listed Sizes

• SOCKET SCREW PRODUCTS
• CAP and SET SCREWS
• NUTS • TAPER PINS • STUDS

Chicago "Safety Plus" products are designed to give you a tighter, lower cost fastening for any heavy duty purpose. To speed delivery time, call the INDUSTRIAL SUPPLY DISTRIBUTOR nearest you today. Ask for Chicago and get "Safety Plus".

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Read by Sight, Sound or Feel.

- Permanently Accurate
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in inch ounces . . . inch pounds . . . foot pounds (All Sizes from 0-6000 ft. lbs.)

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GET to know your people *before* you have to get tough with 'em. It's poor policy to make their acquaintance by bawling 'em out. Introduction by insult is no longer a successful management routine.

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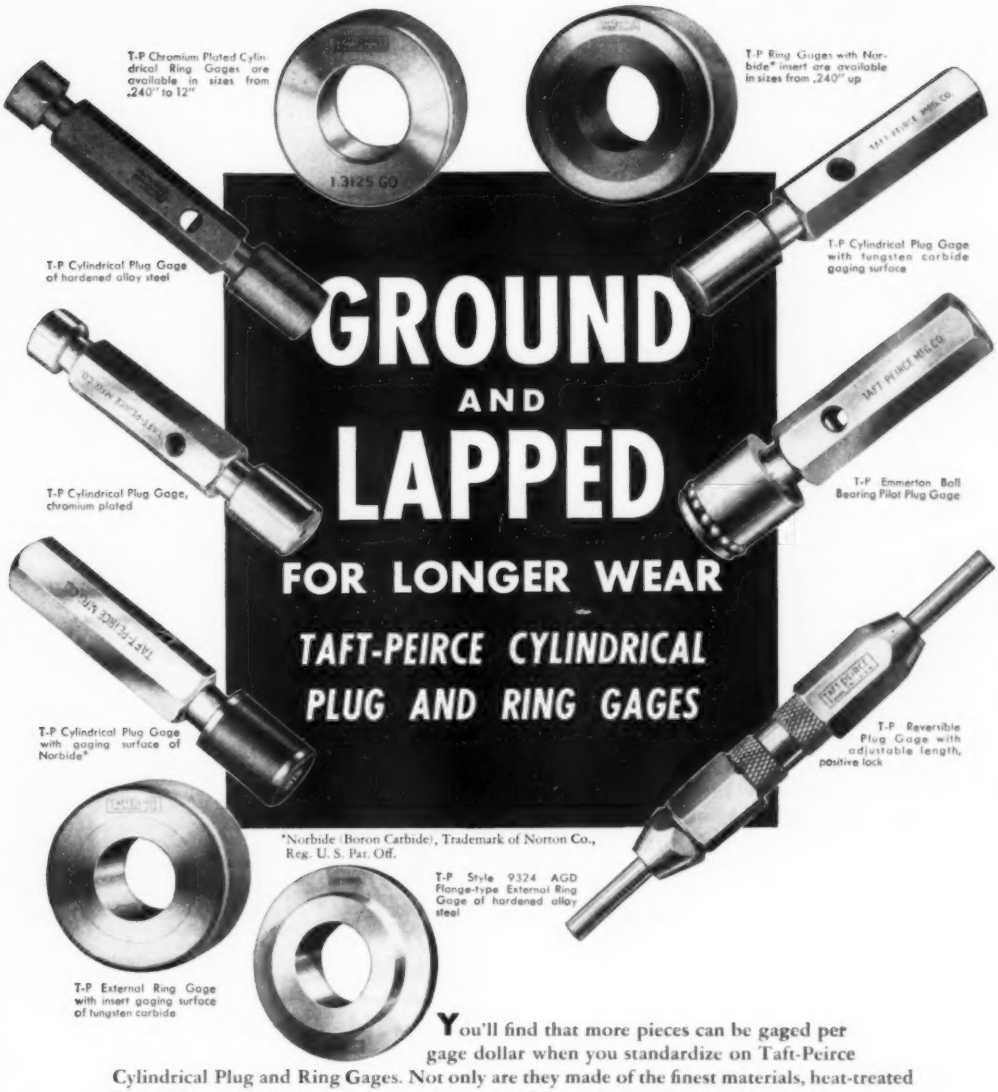
T-P Chromium Plated Cylindrical Ring Gages are available in sizes from .240" to 12"
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T-P Ring Gages with Norbide* insert are available in sizes from .240" up
T-P Cylindrical Plug Gage of hardened alloy steel
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FOR LONGER WEAR
TAFT-PEIRCE CYLINDRICAL PLUG AND RING GAGES
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You'll find that more pieces can be gaged per gage dollar when you standardize on Taft-Peirce Cylindrical Plug and Ring Gages. Not only are they made of the finest materials, heat-treated for maximum hardness, but they are ground and lapped to gagemakers' limits of accuracy by a special process which produces a super-smooth surface, assuring long wear-life and dependable precision.

The exceptionally complete Taft-Peirce Gage line includes Emmerton Ball Bearing Plug Gages, special gages to your specifications, and of course all American Gage Design standards. Available in alloy steel, Norbide,* Tungsten Carbide and Chromium plated. Write to:

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T-P MEANS TOP PRECISION

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"Vibra-Flow"

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Will feed parts . . . small, medium or large . . . of various shapes and materials . . . single file . . . in oriented position . . . at variable rates . . . WITHOUT DAMAGE . . . to grinders and presses, inspection and packaging devices, and other automatic processing equipment.

Units are very compact. Operate by controlled electromagnetic vibration—no motors, gears, cams, belts, etc., to require expensive maintenance.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY

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For Grinding, Boring, Milling and Drilling

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Builders of Precision Spindles Since 1920

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SEE FULL PAGE ADVERTISEMENTS opposite "Backlash" in American Machinist describing 10" Toolroom Lathe (9-4-50; 11-27-50; 2-19-51; 4-16-51); 9" x 18" Plain Cabinet Lathe (1-22-51); 9" Swing Hand Turret Lathe (10-2-50; 5-14-51); 8½" x 20" Instrument Lathe (3-19-51); 10" x 24" Universal Hydraulic Grinder (10-30-50, 12-25-50; 2-19-51).

For Complete informative literature on the entire line of Rivett lathes and grinders, write to

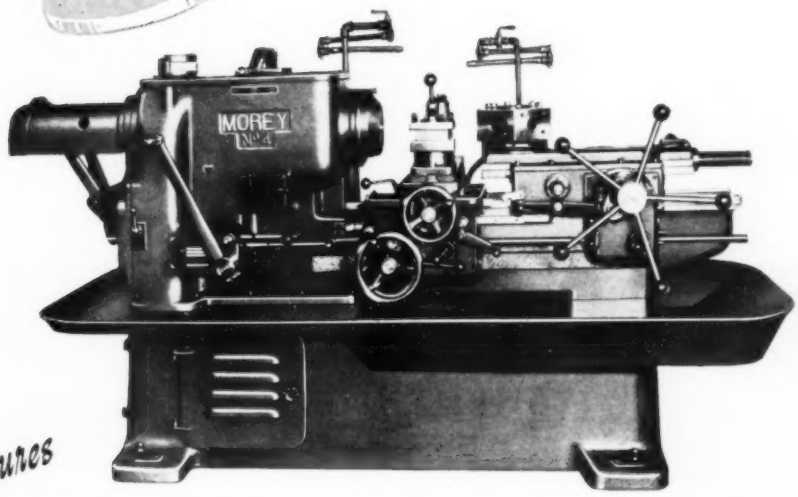
Dept. AMM. **RIVETT LATHE & GRINDER, Inc.,** *Brighton 35, Boston, Mass.*

MOREY

TURRET LATHES

No. 2 Plain Type

Nos. 3, 4 and 5 Universal Type



Features

Infinite variable vibrationless spindle speeds.

Remote speed selection control for speed and ease of operation.

The newly designed MOREY TURRET LATHES take advantage of tungsten carbide tools and incorporate all technical improvements in metals, electronics and hydraulics . . . our design is not hampered by tradition.

Size	Bar Capacity	Swing	Motor
No. 2 Plain.....	1" x 6"	14"	3 HP
No. 3 Universal....	1⅛" x 10"	16½"	5 HP
No. 4 Universal....	2" x 12"	19½"	7½ HP
No. 5 Universal....	2⅛" x 14"	21¼"	15 HP

FOR BAR and CHUCKING WORK

OBTAIN MAXIMUM PRODUCTION WITH MINIMUM EFFORT FROM MOREY TURRET LATHES . . . INVESTIGATE!

MOREY MACHINERY CO. INC.

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DRILL-CHANGE TIME CUT IN HALF BY BELL AIRCRAFT WITH WAHLSTROM AUTOMATIC CHUCKS

"Time saved changing drills and reamers with Wahlstrom Automatic Chucks is 50% over types requiring keys," reports Charles A. Smith, Supervisor of Tools, Bell Aircraft Corporation. "This ease in changing drills has won approval from operators...increased efficiency in our drill press department."

You, too, can cut costly minutes changing tools in drill press work...spotting, reaming and drilling in jig borers and millers...in lathe work for burring, turning and filing. *One spindle does the work of several.* Smooth, hardened, ground jaws grip tight without chewing into tools...grip increases with the load.

For uninterrupted production use quick-change AMF Wahlstrom Chucks—the only *fully-automatic* drill chucks holding widest range of straight-shank tools...Model A—1/32" to 1/2"...Model AA—1/64" to 3/8"...Model B for larger straight-shank tools...Model C for taper-shank tools and fully-automatic tappers.

See your local distributor or write for Bulletin 56-5.

AMERICAN MACHINE & FOUNDRY CO.
Wahlstrom Tool Division, 5502 Second Ave., Brooklyn 20, N. Y.

WAHLSTROM
amf *fully automatic*
CHUCKS

NO KEYS, COLLETS OR WRENCHES

DEFEAT VIBRATION
WITH GRIPCO LOCK NUTS

Use *Gripco* Lock Nuts in assembling your products and they'll "stay put" on the Bolt in spite of Vibration, Tension, Pressure and Shearing Forces.

The tenacious grip of their deflected threads on the Bolt is not dependent on the fit of assembled parts, but only on the grip of the deflected Gripco Nut threads against the Bolt threads. Oil, Water and Chemicals cannot break this grip.

DEFEAT VIBRATION
WITH GRIPCO "PILOT" WELD NUTS

Gripco "Pilot" Projection Weld Nuts with Gripco deflected threads make assembled parts *doubly secure.* The weld nuts are accurately centered over the bolt hole by the raised "Pilot" collar for Resistance Welding at exactly the right location. *The Bolt screws into the nut* and the deflected Gripco Nut threads lock the Bolt and Weld Nut together—and they stay that way *permanently* unless released by a wrench.

Gripco "Pilot" Projection Weld Nuts can also be furnished without Gripco Locking feature. Samples of types and sizes of the Gripco Lock Nuts or Gripco Weld Nuts will be sent upon request. Compare Gripco low price, low application cost, and high holding power with any other device.

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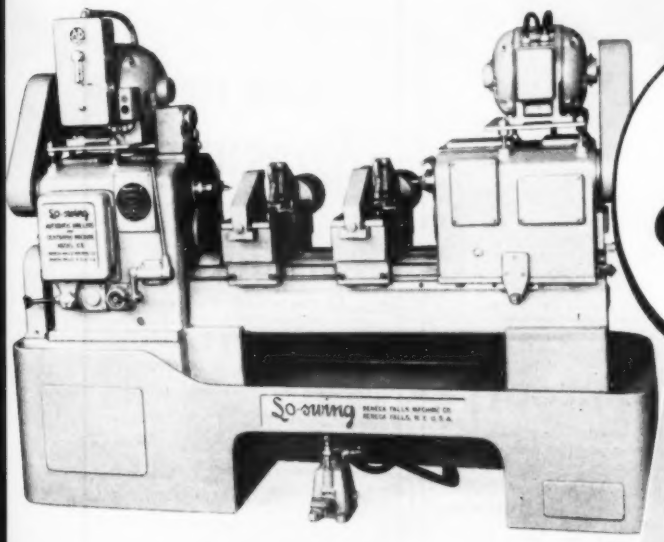
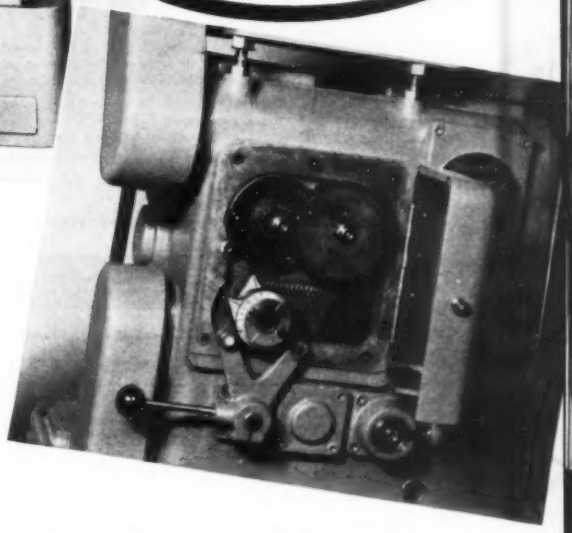


REDUCE YOUR CENTERING COSTS



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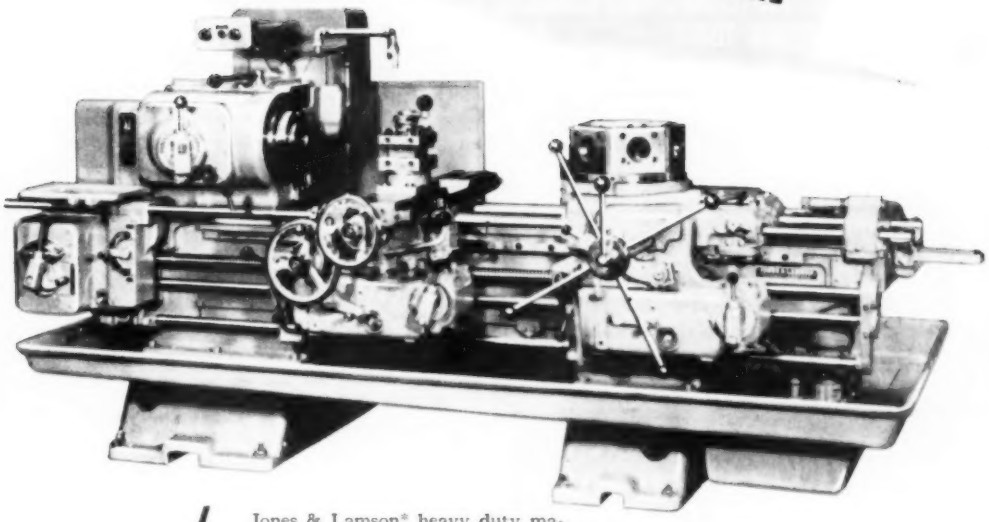

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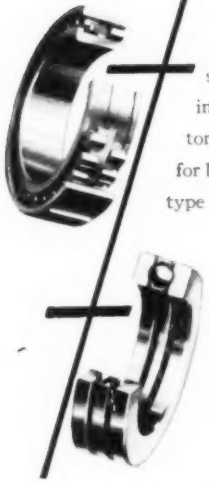

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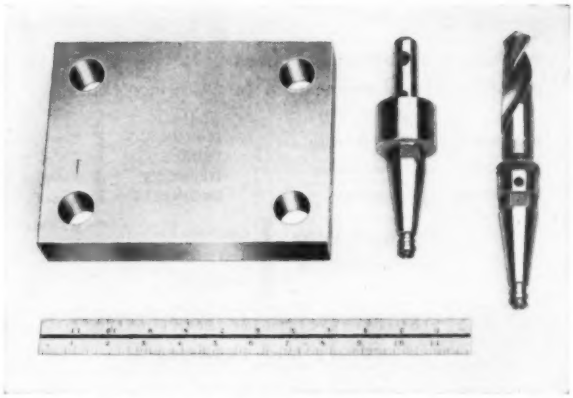

The only tools used to complete this Jig Borer production job were the drill and carbide bit. The carbide bit will hold size for four holes. The last hole is measured and the tool bit set for the next piece.

Sixteen of these pieces were needed. The four 1" holes are $1\frac{5}{8}$" deep—with location and size tolerances ±.0002". It would be impossible to obtain such accuracy using a drill jig—and impractical on this short run. Then how could you locate, drill, bore and check the four holes in only 8 minutes?

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Total time per piece	480 sec. or 8 min.
Total for 16 pieces (including 30 min. set-up time)	2 hrs. 38 min.

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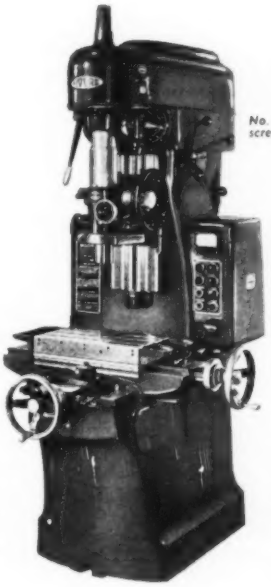

No. 2 Moore Jig Borer has lead screws accurate to 0.0002" in 16" of travel

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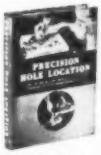

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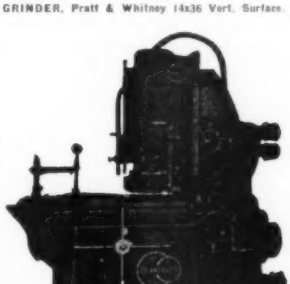

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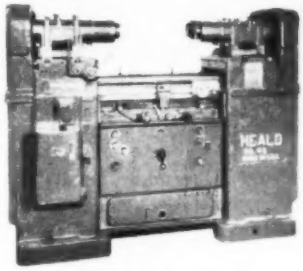

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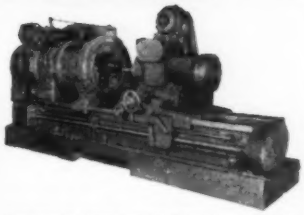

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MILL, Cinc. 18" Mfg. Type with Vert. head.
MILL, #14 Cochrane-Bly Vert. Duplex Univ. Shaper.
MULT-MILLER, U.S. Tool #MM-1-8, Auto. Prod.
MILL, #30H Sundstrand Two Spindle Hyd.
MILL, #1-N Kent-Owens M.D. Plain Horiz.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, Kempsmith #3, Horiz. Univ.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILLING, Brown & Sharpe #1½ Horiz. Univ.
MILLING, MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, K & T #2B, Horiz.
NIBBLER, #2 Savage Roller Die ⅝"x36" cap.
NIBBLER, Gray Turret Type ¼"x24" cap.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILLER, Hanson Whitney 4"x9" Univ.
THREAD MILLER, Lees Bradner #40A Automatic
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine.
PAPER SHREDDER, #10 Mitts & Merrill, M.D.
PLANER, Gray 30"x30"x10' A.C. Motor Dr.
TAPPER, W & S #1 Sgle. Spdle.
POWER PRESS, Bliss #164 Open Back.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS — Bliss - Consolidated #163 - B Straight Side Dble. Crank, 45 tons.
PRESS, #78½ Bliss S.S. 9½" Str. M.D.
PRESS, #14 Toledo, Horn. M.D.
PRESS, V & O #4 O.B.I. 38 tons.
PRESS, Robinson #3 O.B.I. 58 tons.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS Toledo 50¼ S.S. 440 ton cap. 8" str.
PRESS Waterbury-Farrell High Speed 60 tons #3W.
PRESS, 68C Bliss Double Action, 3 crank.
WHEEL PRESS, Caldwell 200 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #6B Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hasker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".
PUNCH, H&J #5 Sgle end. 48" Thr. 2" thru 1½".
RIVET SETTER, ⅜" cap. Penn. Tubular Rivet.
ROLLS, #1 Buffalo Forge Wrapping.
ROUTER, #W240D, Onstrud, Electric H.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade
CUT-OFF SAW, Yates-American #M-90
SAW, #302 Campbell Abrasive Cut-off.
SAW, #20-C Racine Shear Cut 6"x6" cap.
SAW, NS18-10 Grob Band & Butt Welder.
SAW, Band, Tannewitz #GH-36" High Speed
SHAPER, 16" American B.G. Motor drive.
SHAPER, 32" Cinc. B.G., Motor driven.
SHAPER, Columbia 32" B.G. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, back geared, M.D.
SHEAR, Quickwork #A-1 Rotary 60" Throat, 18 ga.
SPRUE CUTTER, Milwaukee 36 tons, 2½" cap.
SURFACE PLATES & TABLES, all sizes.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

IMMEDIATE DELIVERY

HARD TO FIND MACHINE TOOLS

No. 1FU Foster Fastermatic Automatics, late, serials 164 and 174, quantity of extra tooling (2)

No. 00, No. 0, and No. 2 Brown & Sharpe Automatic Screw Machines and Turner Drives.

4½" Cleveland Model A Automatic Screw Machine, serial #34486.

No. 865 New Britain Chucking Machine, late.

No. 3A Warner & Swasey Saddle Type Turret Lathe, M.D.

No. 4A Warner & Swasey Saddle Type Turret Lathe, M.D.

36-90 Cincinnati Hydromatic Duplex Milling Machine, serial #3B38D1L1, late.

No. 0-8 Cincinnati Vertical Mill, late.

No. 3VG Reed Prentice Vertical Mill, late.

No. 14 Cochran-Bly Universal Mill Shaper.

6" Pratt & Whitney Slotter, M.D.

No. 2 LaSalle Hydraulic Surface Grinder, late.

10"x18" Landis Cylindrical Grinder, late.

Baush Radial Drill and Tapping Machine, late.

No. 2 Manville Four Slide Wire Forming Machine.

Two Bushel Barrett Oil Separator, late.

3" Gleason Bevel Gear Generator, late.

50 Ton Henry & Wright Dieing Machine, Reeves drive.

Agents for Cincinnati Lathes and Canedy-Otto Drill Presses

• SCARCE MACHINE TOOLS.

MACHINE TOOLS

TELEPHONE TAylor 9-8200

LAKE MACHINERY COMPANY

942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

GEAR MACHINES
#36BM Three Spindle Gould & Eberhardt Bevel & Spur Gear Rougher 1941
96"x30" Gould & Eberhardt Gear Hobber
#12-12" Gleason Two Tool Straight Bevel Gear Rougher

GRINDERS—CYLINDRICAL
10"x18" Landis Type C Hydraulic—1940
10"x18" Norton Type C Hydraulic—reciprocating spindle—1944
6"x18" Landis Type C Hydraulic—rapid infeed—1941
18"x120" Norton Plain

GRINDERS—INTERNAL
#72AS Heald Plain Extension Bridge—1942
#73 Heald Airplane Cylinder & Sleeve—1944
#81 Heald Plain Chuck—1942

GRINDER—SURFACE
15"x15"x72" Norton Openside

GRINDER—UNIVERSAL
12"x36" Cincinnati—1940

GRINDER—THREAD
Model TG-615 Jones & Lamson Automatic (seve al) 1941

HEADERS
#250F Manville DSSD—1941
#2 Manville DSSD
#00 Waterbury Farrel DSOD
#2C Manville SSSD Ball
#5 Manville SSSD Ball
#188c Manville SSSD Ball

LATHES
14"x6' REED PRENTICE (2)—1941
20"x9' Reed Prentice—1941
8"x84" Seneca Falls Lo-Swing—1941
8"x120" Seneca Falls Lo-Swing
26"x33' Swift Geared Head—1941

MILLERS
24" Cincinnati Automatic Duplex (2)
48" Cincinnati Automatic Duplex
#34-36 Cincinnati Plain Hydromatic (2) Tracer Controlled—1942

#56-96 Cincinnati Plain Hydromatic—several—1940
#1-12 Cincinnati Plain Automatic—1939
54"x18' Ingersoll Slab Miller

PLANER
120"x96"x20' Cincinnati Heavy Duty Box Table

SCREW MACHINES
#2G Brown & Sharpe—1941
#452 New Britain New-Matic Chucker

TURRET LATHES
#2L Gisholt Universal Geared Head—1941
#3 Gisholt Universal Ram Type
#4 Gisholt Universal Ram Type
#3A Warner & Swasey Universal Geared Head
#4A Warner & Swasey Universal
#4 Warner & Swasey Universal

MISCELLANEOUS
#3 LeBlond Rifling Machine—1941
Webster Tallmadge Single Gun Barrel Boring—1942
#430 WF & J Barnes Two-Spindle Deep Hole Drilling & Boring—1942
#602 Wallace Hydraulic Rotary Bending Machine—1944

J. L. LUCAS & SON, INC.

MACHINE TOOLS *Established in 1905*

BOX 3006A BRIDGEPORT 5, CONN. TEL. - FAIRFIELD 9-3393 CABLE - "LUCASTOOLS"

PRACTICALLY NEW

BLISS NO. 26A KNUCKLE JOINT PRESS

Tie-rod frame construction. Arranged for dial feed. Bed area 36"x40". Stroke 5". Air operated friction clutch.

National Machinery Exchange, Inc.
138 Mott St. New York 13, N. Y.
CAnal 6-2470

MODERN MACHINES

#40 Landis Floor Type Horizontal Boring Mill
6D Potter & Johnson Automatic Chucking Machine
#35 Excello Thread Grinder
#61A Fellows Gear Shaper
#1A Warner & Swasey Turret Lathe
#3B Waterbury Farrell Thread Rollers
#0 Brown & Sharpe Automatic Screw Machines with Turner Drives
#3 Barber Colman Hobbing Machine
G1-A Acme Gridley 1½ Automatic Screw Machine
#262 Barnes Camel Back Drill
#0 Giddings & Lewis 3½" Bar Horiz. Boring Mill
4'11" American Radial Drill
3'9" Cincinnati Bickford Radial Drill

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St. Providence, R. I.

ABRASIVE CUT-OFF: #212 Campbell, 2" bar cap. coolant pump, 7½ HP, M.D., 1945
AUTOMATIC: 2" Cleveland "A", 1941
AUTO CHUCKER: 8½"x8" Goss & DeLeeuw
CHIP WRINGER: ¾" BU, Barrett-Nat'l., M.D.
DIEING PRESS: 25-Ton Henry & Wright, Reeves Drive, Madison-Kipp Oiling, 1942
DRILL: 4 Sp. Kingsbury Ver., No. 8 heads
DRILL PRESS: 48-12" Edlund, BG, P.F., 1941
GRINDER: Sterling Univ. T&C, 1944
GRINDER: #65 Gallmeyer & Livingston, Hydraulic, 12"x48" Magnetic Chuck
GRINDER: #12 Covel Univ. Cutter & Tool, 1942
LATHE: 12"x54" LeBlond HG, G.H., 1943
LATHE: 14"x30" Bradford, Taper, 1941
MILL: No. O B. & S. Omniversal, 1940
MILL: No. 000 B. & S. Elec. Prod. 1941
MILL: #0-8 Cincinnati Plain Horizontal, 1943
RADIAL DRILL: 4'x11" Cin.-Bickford, Gearbox
SANDERS: No. AG8 & G8 Porter-Cable
SHAPER: 36" American V-Ram, Auto-Oiled
VERTICAL TURRET LATHE: 54" Bullard, New Era

BARRON MACHINERY COMPANY
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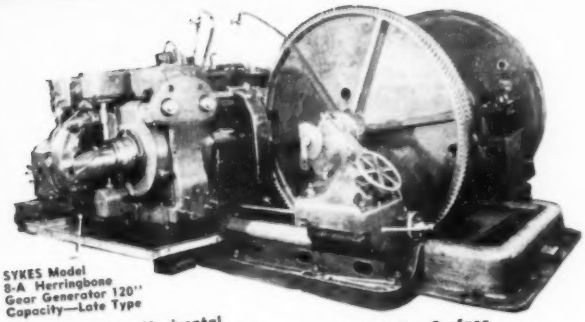
LATEST TYPE *Nearly New* MACHINES



SYKES Model
8-A Herringbone
Gear Generator 120"
Capacity—Late Type

BORING MILLS—Horizontal
FRANKLIN 4¾" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LUCAS #41 3" Bar, Late Type
NILES 8" bar floor type, motor drive
PEGARD Model 924 3⅛" Bar, 925 4⅛" Bar, New
UNIVERSAL 3" Bar, Precision, Late Type

BORING MILLS—Vertical
BULLARD 16" 6-spindle "A" Mult-au-matic

BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.
LaPOINTE #2L M.D. Late
LaPOINTE S.R.V. 15 Ton 48" Stroke, Late Type

DRILLS—Miscellaneous
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; Inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 26" 4-spindle; Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
BAUSH 1½x30" Deep Hole, Late
MOLINE 6-spindle Multiple Hole-Hog; 3⅜" dia.; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.
NATCO D-5 Multiple; adjustable; Late
BODINE #42-20 multi-univ., dial feed; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" and 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE #13 Spur Revel Cutter
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS #40 Tooth Rounder; M.D.
FELLOWS Nos. 6I1A, 6Z2, 715, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 12-M Involute Meas. Instr.; Late
FELLOWS 13-LS Lapper; late
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON #4 and #6 Tester, Late Type
GLEASON 10", 11" & 18" Bevel Gear Gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #4A, #8A gear generator; M.D.

GEAR HOBBERS
BARBER COLMAN #12 dble. overarm; M.D.
GOULD & EBERHARDT #24H, Late
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 14x48" Univ.; late
CINCINNATI 14x72 Model ER Plain, Late Type
LANDIS 10x36, 16x36 Type C Plain, Hyd., Late
LANDIS 4x18 type H; M.D.; late
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 10x18" type C plain Hydr; M.D.
LANDIS 10x24" Univ.; late
LANDIS 29"x130" centers Plain; M.D.
MONARCH 22"x456" centers Model CM Precision Engine Lathe; Helical geared; TIMKEN bearing; M.D.
NORTON 6x30 plain; motor drive
NORTON 10x72" type C Plain; Late
NORTON 17x42" centers crankpin; Hydr. Dble. hd.; M.D.

GRINDERS—Surface
HEALD #22 Rotary, Late Type
HEALD #25A Rotary, Motor Drive
PRATT & WHITNEY 14x36" Model B, Late
BILLITTER 6" Rotary, M.D.
TAFT PIERCE 6" Rotary, M.D.

GRINDERS—Miscellaneous
BRYANT No. 3, 5, 5A, 16-C-16, 16-CP-16, 24-36" Internal hydr.; Late
GLEASON No. 12 Tool Sharpener; late
HEALD No. 81 "Sizematic"; Late
HEALD No. 72-A-5 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
LEMPCO 22x72" Mod. KG Crankshaft; Late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

LATHES—ENGINE & MFG.
AMERICAN 25"x220" centers; Timken; Late
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 36"x32" centers geared; heavy
JONES & LAMSON "FAY" 20x25" Automatic; M.D.; Late
LEHMANN 25x96" cntr; TIMKEN; grd M.D.
LeBLOND 16x36" cent.; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24x120" centers, Late
LODGE & SHIPLEY No. 5—24" and 26" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 14x42" centers "Z" Magnamatic Auto.; TIMKEN; M.D.; Late
NILES 30"x50' Boring "Time-Saver"; Timken; Late
NILES 48"x32' centers Engine; geared; M.D.
REED PRENTICE 16"x24" centers grd; M.D.
SPRINGFIELD 14"x43", geared; M.D.

LATHES—TURRET
GISHOLT No. 3, 4, 5 Ram; TIMKEN; Late
GISHOLT 1L Universal, Late Type
LIBBY 1H-5 Universal, Late Tye
MOREY No. 2 ram type TIMKEN
J & L No. 8A; Late

MILLING MACHINES—Plain
BROWN & SHARPE #12, Late
CINCINNATI 0-8; M.D.; Late
CINCINNATI 4-48, 4 spindle, Tracer; Late
CINCINNATI No. 4 High Power; TIMKEN; Rect. M.D.
CINCINNATI 1-18, 2-24 Timken, Late
KEARNEY & TRECKER, MIL.WAUKEE #3 Timken, M.D.
HERO #4P, New
SUNDSTRAND No. 3 Rigidmill; TIMKEN
PEGARD #1 Plain, New

MILLING MACHINES—MFG.
CINCINNATI #24 Duplex; SPD
GOULD & EBERHARDT 25 Cont. type; M.D.
HALL Style C & D Planetary; Late
INGERSOLL 32x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
INGERSOLL 42"x42"x16', 4 heads, Planer Type, Late
SUNDSTRAND Mod 3A Duplex 42" feed M.D.
TAYLOR & FEN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical
CINCINNATI 0-8 Mod EA Automatic PRT; M.D.; Late

MILLING MACHINES—Thread
HALL Style D Planetary, Late Type
LEES BRADNER HT 12", 54", M.D.; Late
MOREY 12x30", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late
PRATT & WHITNEY 6x132; M.D.

PLANERS
BETTS CONSOLIDATED 84"x92"x16' 4 heads
BETTS CONSOLIDATED 108"x84"x44' 4 heads; PRT; Box Table; M.D.
CLEVELAND 48"x48"x12' Openside; AC; M.D.
DETRICK & HARVEY 48"x48"x16' hydr.
LIBERTY 48"x48"x16' 4 hds. Double housing; vari-voltage
LIBERTY 72"x48"x20' 4 heads; Convertible openside vari-voltage drive; late
NILES 108"x84"x42" 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
SELLERS 60"x60"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x54"x20'; 4 heads; M.D.

SAWS
ESPEN LUCAS No. 670-30' cap Hydr.; Late
HELLER Model SS-1, 6¾" Cap Cold Saw

SCREW MACHINES AUTOMATIC
NEW BRITAIN GRIDLEY Model 65 6 Spindle Chucker, Late

WATCH THIS PAGE

For MODERN high quality machine tools nearly all built new since 1941. These tools are priced well within your equipment budget. *Wire, write or phone for pictures, details and prices, today.*

BROWN & SHARPE 00G High Speed, Late
GYROMATIC Model 40 2⅜" 6 Spindle, Late
BROWN & SHARPE 00G High Speed, Late
GYROMATIC Model 40 2⅜" 6 Spindle, Late

SHAPERS—SLOTTERS
CINCINNATI 16", Heavy; PRT; Late
LeMAIRE 14" Vertical Hydraulic, Late
PRATT & WHITNEY 6" Vertical; M.D.
LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" Vert.; Late

PRESSES
RESCO Mod. 21 Incl. 40 ton, 3" stroke NEW
BIRDSBORO 325 ton Vert Hydr; Late
BLISS No. 410A Toggle Drawing; tie rod; steel gearing
CHAMBERSBURG Horiz. Straightening; 24" str.; M.D.
BLISS No. 3½A geared toggle; dble. acting
GLEASON 15", 25" Quenching; hydr.; M.D.
NIAGARA No. 512 DG tie rod; 282 tons; M.D.
UNITED ENG. 500 ton hydr. forging
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS
ACME 2" forging, upsetting; late
AJAX 2½" forging, upsetting; M.D.
BAKEWELL No. 1, Precision Tapper
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Groover; Late
FOSTER 4x36" centers; Superfinisher; Late
GROB OS-20 Metal Band Saw—Fiber; M.D.
GROB NS-24 Band Saw; M.D.; Late
LANDIS 2" sgle. Dble. Spdle. Threaders; M.D.
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 2 DSOD Readher; M.D.
MANVILLE 1A DSSD Heater; M.D.

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RELIABILITY has been earned by
WIGGLESWORTH MACHINE TOOLS

AUTOMATICS
2" 4 Spindle Cone, 1943
8¾" Conomatic, 5 spindle
1½" Billings & Spencer Dimatic Cutoff

BORING MILLS
4" Landis horizontal, floor type
Century sgle. spdle. hyd. boring machine
72" King, two heads on rail, p.t., r.t.

GRINDERS
6x30" Cinn. cylindrical, model EA
Rotorex Universal Tool and Cutter
10x48" Norton C, semi-auto. cylindrical
12x36" Cincinnati plain cylindrical
14x36" Norton C, semi-auto., cyl.
72A Heald Internal, late
73 Heald Internal, 1944, like new
#300 Hanchett surface, 14x60"
#76RA Rogers knife grinder, 76"
P & W deep hole drill grinder, late
Oliver single point tool
Model 1311 P & W contour, late
10G Sellers, single end, horizontal
5 HP Marschke, single end

DRILLS
4'11" Canedy Otto, late
21" Cinn. Bickford, 4 spdle. #3 M.T.
36" Synder single, #5 M.T.
#4½ Footburt, 4 spindle, #5 M.T.
#1½ Avey, 4 spdle., high speed
#2 Detroit Semi-automatic, horiz.
Kruger 16", six station
Type 14 Natco 12 spindle
#2 LMS Leland-Gifford 4 spindle deep hole
#2 Bausch 24 spdle., #2 M.T.
D6 Colburn, single spindle, #5 M.T.
Model 4230 Bodine Drill & Topper, 12 sta.
Moline Hole Hog, 2 spindle, older

GEAR MACHINERY
672 B & S cutter
7A Fellows, shaper, high speed, hvy dty
61A Fellows, shaper, high speed precision

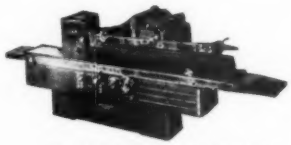
LATHES & TURRETS
22 33"x9' Morris, geared head
12x18" Carbo production
#4A W & S Universal, geared head
Hepburn Shell
12"x30" centers, Handey q.c.g.
#12 LeBlond Automatic Production
Model LoSwing 8 x 108" centers, g. h.
Gisholt Simplimatic, platen type
36" x 14' ctr. LeBlond, cone
36" x 14' centers, American, late

MILLS
#2M Cincinnati Universal
#2 Kempsmith plain horizontal
#2 Cleveland plain horizontal
#3 B & S vertical
#3 Sundstrand Rigidmill, late
#4 Cincinnati High Power horizontal
#4 Cincinnati High Power vertical
#5 B & S plain horizontal
#5 B & S vertical, knee type
24" Cincinnati Duplex
35/60 Cincinnati Hydromatic Duplex
Briggs production, hydraulic
1-8 Kent Owens production, hydraulic
Universal head for #2H K & T
10C Van Norman Contour

FURNACES
Despatch Model DT 26, draw, gas
Whiting Converter, 2 ton cap., late
Lithdraw heat treat, 1206° F, late
Thermonic Induction, heat treat, late

MISCELLANEOUS
PLANER: 48x48"x16' Detrick & Harvey
LAPPERS: #2 Cincinnati Centerless, late
86-36" Gardner, vert. spdle.
BROACH: 10 ton Oilgear, model PED, late
HAMMER: 300# Bradley Upright Helve
PROFILER: Betts, 2 spindle
COMPARATOR: J & L, 30" shadowgraph
BROACH: #4 Lapointe, horizontal
WELDERS: Hobart and P & H, Arc, 400 amp.
BULLDOZER: #2 Ajax High Speed, 30 ton
25" Smith & Mills, backgeared
SHEAR: #23 Niagara 3" 14 gauge, late
#6 Quick-work rotary, 4' throat, ½"

THEADERS & TAPPERS
6x80" P & W miller
Bausch radial tapper, ½" cap.
Haskins tapper, type 2 CAP, 5/16"
#2BG Garvin tapper, 1¼" cap.
TG 615 J & L grinder, late
#2 Dalzen, 3" O.D., grinder
Model 40 Lees Bradner, miller
LT 6 x 36 Lees Bradner
#33 Excello External, grinder



No. 50 Excello Thread Grinder

T. R. WIGGLESWORTH MACHIERY COMPANY
1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

LATE MODEL MACHINE TOOLS . .

AUTOMATICS
No. 61 New Britain, 1⅝" cap. 1942.
2" Cleveland, Model A. 1942.
1-1/10" Cleveland, Model A. 1943.

DRILLS
No. B2A Natco Single Spdl. Latest.
18 Spindle Barnes, Hydraulic. 1942.

DRILLS, SENSITIVE
No. 4B-12 Edlund. 1942.
No. 2B-8 Edlund. 1942.

GEAR EQUIPMENT
No. 6 Gleason Revacycle Generator. 1940.
No. 64SA3 Fellows Gear Shaper. 1943.
No. 72 Fellows Gear Shaper. 1942.
No. 7 L.S. Fellows Gear Lapper. 1944.
Pratt & Whitney Gear Grinder. 1942.
8" Red Wing Internal Shaver. 1942.
15" Red Wing External Lapper. 1942.
Red Wing Univ. Gear Checker. 1942.

GRINDERS, CYLINDRICAL
14"x168" Norton Plain Type C. 1942.
14"x48" Norton Type C Pl. Hyd. 1941.
14"x48" Landis Type C Pl. Hyd. 1943.
10"x36" Cincinnati Plain Hyd. 1942.
10"x18" Landis Type C Pl. Hyd. 1942.
6"x18" Landis Pl. 45° Angle. 1942.

GRINDERS, INTERNAL
No. 24-36 Bryant Hydraulic. 1943.
No. 16 CP 16 Bryant Hydraulic. 1942.
No. 16-16 Bryant Hydraulic. 1942.
No. 172 Heald Hyd. Cap. 1940.
No. 75A Heald, Two Meter. 1943.
No. 72A3 Heald Plain Hyd. 1943.
No. 50 Heald Plain Hydraulic. 1943.
No. 104 Rivett Int. & Ext. 1943.

GRINDERS, SURFACE
14"x30" P & W Vertical Hyd. 1942.
No. 22 Heald Rotary, 12" Chuck. 1943.

GRINDERS, THREAD
No. 33 Excello Thread Grinder. 1943.
No. 31 Excello Thread Grinder. 1941.

GUN BARREL MACHINES
No. ½Bx50 P & W Reamer. Latest.
No. ½Bx30 P & W Reamer. Latest.
No. ½Bx30 P & W Rifler. Latest.

LATHES, ENGINE
20"x28' Center LeBlond Heavy Duty. 1941.
18"x60" Reed-Prentice, G.H., M.D.

LATHES, PRODUCTION
No. 3FU Foster Fasteramatic Platen. 1942.
No. 4D Potter & Johnston. Late.
No. 3D Gisholt Simplimatic. 1939.
20"x25" Fay Automatic. 1942.
14"x42" Monarch "Magna-Matic." 1941.
10"x12" LeBlond Multi-Cut. Late.
Lipe Carbo-Matic. 1942.
Lipe Carbo Lathe. 1942.

LATHES, TURRET
No. 5 Gisholt Universal. 1942.
No. 4AR Libby Hand Carriage. 1942.
No. 3 Gisholt Universal. 1942.
No. 2 Warner & Swasey Simplified. 1941.

MILLS
No. 2K Milwaukee Univ. 1943.
No. 2L Cincinnati Plain. 1943.
No. 3B Kearney & Trecker, M. D.

MILLS, PRODUCTION
No. 2-2B Kent-Owens Hydraulic. 1942.
No. 34-3B Cinn. Vert. Rail Type. 1944.
No. 3A Sundstrand Copy Mill. 1942.
No. 00 Cincinnati Plain Auto. 1942.

MILLING MACHINES, THREAD
6"x36" Lees-Bradner, Model LT. 1942.

WELDERS
Taylor-Winfield Hi-Wave. 1940.

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MacDell Availables in Late Type Guaranteed Machine Tools

Knight No. 40 Vertical Mill Equipped for Jig Boring Mfg. 1942

No. 3 Plan-O-Mill Form and Thread Milling Machine. Mfg. 1943.

Brown & Sharpe No. 12 Automatic Mill 18" Table Travel Mfg. 1942

Norton 16"x48" Hydraulic Universal Grinder with Complete Internal Attachment

Norton 6"x30" Semi-Automatic Cyl. Grinder Electric Cycle Controls & Recip. Wheel Mfg. 1943

Brown & Sharpe No. 2 14"x30" Universal Grinder Complete Internal Attach. Mfg. 1942

Lodge & Shipley 3A 20"x27" CC Automatic Lathe Air Cyl. Air Op Tail Stock Front & Rear Slides Mfg. 1943

Cleveland 3¾" Model A Single Spindle, Automatic with Tooling Mfg. 1943

Cinc. 36" Heavy Duty Univ. Shaper With Power Down Feed Mfg. 1943

Gisholt 15 Dynetric Balancer Mfg. 1947.

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SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24", VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. O, 3" cap.
Giddings & Lewis No. 32, 3½" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
Bausch Radial Drill & Tapper
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Foote-Burt #25
Walker-Turner Radial. 2½'
Leland Gifford 2LMS
Natco Multi-spindle

ENGRAVERS

Auto Engravers Bench Type
Deckel Type 3 GK2 Dimensional, New
Gorton #1A, ID, ME
Gorton #3B 3 Dimensional

GEAR EQUIPMENT

Barber-Colman #3, #2
Barber-Colman #12 Hobber (2)
Fellows High Speed Shapers 712, 72, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

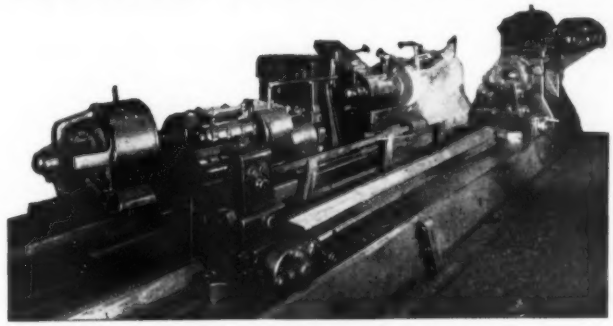
Bryant #5 Internal
Covel #91A Univ. Tool & Cutter
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 16"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G
Port Cable Belt WG8
Pratt & Whitney Contour
Pratt & Whitney Radius #R6, K.O. Lee Tool
Van Norman #666 Crankshaft
Vernon Tool & Cutter
Wicaco Internal

GRINDERS, SURFACE

Abrasive 3B 8x24", #33, #34 Vert.
#10 Blanchard 16" Chuck
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2 Mag. Chuck
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Pratt & whitney 12x36" Vert.
Reid 11x36 Motor In Base

LATHES

Bertram 28"x22' CC, Late
Bridgeford 36"x20', 32"x16'.



Norton Roll Grinder 50" x 28' (actual photo)

Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12"x42" Geared Head Late, 12"x30", 14"x54"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Monarch 10"x20" EE Latest
Monarch 12"x30" CKK Late (4), CK.
Putnam 36"x22'
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15"
Sundstrand 15" Stub

MILLS, PLAIN, UNIVERSAL & PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #000, 21
Burke #4 Plain & Univ.
Cinn. 08 Plain
Cinn. 1-12 Mfg.
Cincinnati 1 M Univ.
Kent Owens 1V
Milwaukee #2B, 3B Plain & Univ.
Simmons Micro-Mill
Sundstrand 0.00 Rigidmil
6"x20" P&W Thread Mill
Van Norman #2 Universal

MILLS, VERTICAL

Brown & Sharpe #3 single pulley drive
Cincinnati #4, OS Vert. #2, 3, SPD
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 SP

PRESSES

Bliss 304A 4" Str.
Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Ferracute EG54, 400 Ton Knuckle
Niagara Horning, 15 Ton
Niagara A13¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

TURRET LATHES

Acme 6W Fox 2 9/16" Cap.
Bardons & Oliver #2 Late, #3
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6 2" Shell Turret (2)
Foster #3B 4½" Cap.
Gisholt #4 & #5, Univ. bar feeds, Late
Gisholt #2L Univ. Saddle Type, Late
Hardinge second operation.
Jones & Lamson 2½" Saddle Univ. Late
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A
Warner & Swasey G.H. #5 Univ., Late
Warner & Swasey #2 & #4 Timken Head

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500 ton Shaft Straightener 24' Long Bed. Watson Stillman
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50 Ton William & White Gap Press, 20" St. 54"x20" Bed—24" opening
600 Ton William & White Up-Moving Ram 42"x60" platen 12" str., 24" opening self-contained.

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Automatic, Cleveland Model B 1 1/16"
Automatic B & S #00G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Filers—DoAll Band Filer
Filers—Grob Band Filer
Hacksaw: Peerless 6"x6"
Hacksaw: Racine 10x10" Hyd.
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M
Shapers: 24" Rockford, 24" Cinci., 28" Gould & Eberhardt. Many Others
Tappers: #1 Bakewell, #3C Haskins
Vertical Slaper: Pratt & Whitney 6" Model "B" 1941
Welder: 50 KVA Eisler Air Operated
Welder: Taylor-Winfield 50 KVA Hi-Wave

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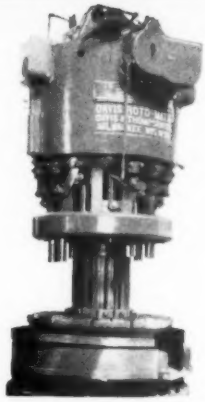

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3 SPINDLE LELAND GIFFORD, Hydraulic Feed, #2 Morse Taper, overhang 7½"

4 SPINDLE AVEY W/Hydraulic Unit, #2 Morse Tapers, serial #16407

#210 BARNES, #4 Morse Taper, Overhang 10¾", 5 H.P. 220/440 volt

#216 BAKER Heavy Duty #5 Morse Taper, Capacity in steel 1½", speeds 76-541 RPM

#217 BAKER, #4 Morse Taper, Capacity 2", swing 24½", table 17"x23"

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MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

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BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 38"x64". Quantity of boring bars.

CINCINNATI 68"x48"x14' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

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GEAR HOBBER, #12 Barber Coleman
GEAR PLANER, "11" Rienecker, Bevel
GEAR SHAPER, No. 75 Fellows High Speed
6IA, 6I, & 8AA, 6 Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 18"x48" Cincl., Cyl., M.D.
GRINDER, No. 8-T Sellers, Tool, '42
GRINDER, No. 16Y2B Bryant, Int., 1943
GRINDER, No. 17A Heald Gap, Int. 54" sw., '42
GRINDER, No. 72A3 Heald Internal Pl., '42
GRINDER, No. 72A5 Heald Internal, 1943
GRINDER, Micro-Internal, Large
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, UNIV. 12"x36" Thompson M.D.
LATHE, 42"x31' con. Putnam Grd. Hd.
18"x5" cen. Cincl., 20½" sw., 1944
32"x25' con. Sommerfeld, 2 T.A., 2 carr., '42
22"x24¾"x48" cen. Skoda, New
20"x48" con. American, T.A., (2)
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18" & 12"x6' Hendeys Grd. Hd., T.A. (2)
25"x18' Bed LeBlond Grd. Hd., M.D.
25"x12' bed Bridgeford Grd. Hd. (3)
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TURRET LA., No. 3AL Gisholt, 6¼" hole in spin.
20" Libby "C" 4½" capty.
No. 1B Foster Univ., 2" capty. (2)
No. 2B Foster Univ. 3½" capty. Bar.
THREAD MILLER, 12"x80" Morey Shields, '42
MILLER UNIV., No. 2A Brown & Sharpe
MILLERS HORIZ., Nos. 2 & 3 Cincl. Pl. Cone Motorized
No. 1½ Cincl. Pl. Lima Dr., Vert. Attach.
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(4) W & S #2 Bar Feed (1942) 1" Cap.

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GLEASON: 3" Straight Bevel Gear
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SYKES: Rack Cutting Machine 24" long (New)

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GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

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FELLOWS: No. 12-C Spacing Tester
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GLEASON: 3" Bevel Gear Tester
NATIONAL BROACH: SIC—12" Red Ring Tester

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BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
CINCINNATI: 10"x36" Hydraulic, plain
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic, for grinding crankshafts
NORTON: 6"x18" plain, hydraulic
NORTON: 10"x18" plain, hydraulic
NORTON: 10"x18" 45° angle wheel head
NORTON: Crankshaft Grinder, 23"x72"
VAN NORMAN: #666 Crankshaft Regrinder, 20"x48"

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BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
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HEALD: 72A5 Plain & Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 T-bed, Universal
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VAN NORMAN: #639, capacity 7" diameter
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VAN NORMAN: #3½ Universal, capacity up to 3½" dia.

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ARTER: A-3—12" Rotary
HEALD: 8" Rotary
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LODGE & SHIPLEY: No. 3A Duomatic
MONARCH: 24"x60" Geared Head
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MICHIGAN: 1712 Relieving, 12"x32"
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HERBERT: #8 for chuck work, 20" swing (New 4 machines)
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BRIDGEPORT: Vertical Miller, power feed
CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
RICE-BARTON: Duplex Spline
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" table with power feed, high spindle speeds, for toolroom work
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CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity
NATCO: Vertical Tapper 16 spindle
PRODUCTO: Hand Tapper

TOOL SHARPENERS

FELLOWS: Flat Top Helical Gear Cutter
OLIVER: 2A Face Miller Grinder
OLIVER: 10" Template Tool Bit Grinder
RANSOM: 2 Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

MISCELLANEOUS

CUT-OFF: Campbell, Abrasive 423 Cutalator, 4½" dia. capacity
CUT-OFF: Pipe & Tube, 10" Williams
PRESS: Sirew, Gen. Flex. 3 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hydraulic
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Schumacher & Boye 36"x24' bed, Internal Face Plate Drive, 15' center distance, Turner Gear Box
American 30"x12' bed, 12 speed head, Vee belt motor drive, 2 9/16" hole in spindle.
Niles 30"x10' centers Timesaver.
Lodge & Shipley 24"x12' bed, 5 SCD, taper.
LeBlond 24"x10' bed, 3 SCD.
American 24"x10' bed, 8 speed head.
LeBlond 21"x10' bed, 3 SCD.
Lodge & Shipley 20"x8' bed, 12 spindle speeds.
Monarch 20"x6' bed, 8 speed head, drop lever handles.
Lodge & Shipley 18"x9' bed, Bowl head, 3 SCD.
American 18"x8' bed, Bowl head, 3 SCD.
Lodge & Shipley 18"x6' bed, 12 spindle speeds.
Monarch 16"x8' bed, 3 SCD.
American 16"x8' bed, bowl head, 3 SCD.
Lodge & Shipley 16"x6' bed, 12 spindle speeds.
Hendey 14"x6' bed, Yoke head, 4 SCD.
Monarch 14"x6' bed, 3 SCD.

BORING MILLS

Colburn 54", 2 heads on cross rail.

RADIAL DRILLS

Cincinnati Bickford, 3'9" column.

GEAR MACHINERY

Brown & Sharpe 3-26, with flywheel on cutter.
Gleason 54" Bevel Gear Planer, cone driven.

GRINDERS, CUTTER

Sellers, 4T, motor driven, late type.
Sellers, 6T, motor driven, late type.

GRINDERS, DISC

U. S. Model 80, Double end, 7½ HP.
Gardner 24-53", vertical spindle.

GRINDERS, CYLINDRICAL

Brown & Sharpe #5, plain, complete, late type.
Landis #2, belt driven.
Landis 10x24, Type C universal, late type.
Cincinnati 10x36, plain, arranged for plunge cut grinding.
Landis 26x144", motor driven.
Landis 16"x72" plain, belt driven.
Norton 10x24 plain.

GRINDERS, INTERNAL

Heald #78 Centerless, Internal & Cylindrical late type.
Micro, Model FG., new 1932.
Heald #70, new 1941.
Landis Thread Grinder, #6, new 1944.

HAMMERS

Nazel 6N, 40 HP motor.
Mayer 50# power driven.
Little Giant, 100#, belt driven.

MILLERS—AUTO. OR PROD.

Ingersoll, 42x36x12', 4 head adjustable rail.
Ohio 40" Tilted Rotary.

MILLERS—UNIVERSAL

Milwaukee 1B, single pulley drive.
Cincinnati #3, 3 SCD with Reeves motor drive.
Cincinnati #3, single pulley drive.
Brown & Sharpe 3A, single pulley drive.
Brown & Sharpe 4A, single pulley drive.

PLANERS

Cincinnati 24x24x6', belt drive.
Gray 24x24x6', belt drive.
Gray 36x36x12', spiral gear drive.
Cleveland Openside, 26x26x8'.
Niles Bement Pond, 84x72x14', box table, 4 heads, electric rail clamp.

SHAPERS

Smith & Mills, 14", plain crank.
Gould & Eberhardt, 16" gearbox drive.
Barker, 18", 4 SCD.
Averbeck, 21", 4 SCD.
Gould & Eberhardt, 24", gear box drive.
Columbia, 28" single pulley drive.
Cincinnati, 32", 4 SCD.

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Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

FINE LATE TYPE GUARANTEED TOOLS

No. 5 HILLES & JONES Pyramid Type Plate Bending Rolls, 14" diameter top roll, 12" diameter bottom roll, 10' long, drop end housing, 30 HP slip ring motors

No. 7A JONES & LAMSON Universal Saddle Type Turret Lathe, preselector head, hardened ways

No. 2 SIMMONS Micro-Speed Turret Lathe, bar feed, 3 jaw chuck, 4 jaw chuck, power feed to turret, tooling, coolant pump, AC motor

56"x18' CMC Heavy Duty Lathe, 24 speed geared head, power rapid traverse, 30HP AC motor

100" SELLERS Vertical Boring Mill, 2 swivel heads on rail, rapid traverse, 40HP motor drive, rebuilt, excellent

10'-16" CMC Heavy Duty Vertical Boring Mill, extension type, 2 swivel heads on cross rail, weight approx. 125,000#

100" BERTRAM (Niles Patterns) Vertical Boring Mill, 2 heads on rail, rapid traverse

No. 2D KEARNEY & TRECKER Rotary Head Die Miller, cherring attachment, right angle milling attachment, slotting attachment, rotary table, measuring rods, new 1943

No. 10 BROWN & SHARPE Tool Grinder, 1943

No. 7125A FELLOWS High Speed Gear Shaper, change gears 1943

No. 5 JOHNSON O.B.I. Press, new 1944, 55 tons

No. 6 TOLEDO O.B.I. Press, 70 tons

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

V-6-24 COLONIAL Broach, 6 ton, 24" stroke, 1947

V-6-36 COLONIAL Broach, 6 ton, 36" stroke

36"x36"x10' GRAY Planer, DC reversing drive, box table, rapid traverse

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1825 NIAGARA ST BUFFALO 7, N.Y.

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We have for sale a 4' 11" CINCINNATI GILBERT Radial Drill late style, like new.

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SOME HEADLINERS ALL LIKE NEW

Cincinnati #2-18 Rise & Fall Miller, New 1942
Brown & Sharpe #2 Universal Cylindrical Grinder, Internal spindle, new 1942
Heald #25A Rotary Surface Grinder, 24" Magnetic Chuck, new 1941
Gallmeyer & Livingston #30 Hydraulic Surface Grinder, 8"x24" capacity, New 1940
Leland Gifford #2LMS & Buffalo #2 Motor Spindle Drills
Pels #MK10 Universal Ironworker
Barber Colman #HRS Hobsharpener & Tool Grinder, New 1944
Brown & Sharpe #13 Univ. Tool & Cutter, New 1937
H-2 Micromatic Hydrohone, New 1943

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16 Acme Turret Lathe, Ser. No. 6496
No. 3 Gisholt Turret Lathe, Ser. No. 798-23
No. 2 Simmons Turret Lathe, Ser. No. 2325
Model 40 Lees Bradner Thread Miller, Ser. No. 40A-197
Model LT Lees Bradner Thread Miller, Ser. No. 308
No. 0B Cincinnati Vertical Miller, Ten available
No. 3 Brown & Sharpe Vertical Miller, Ser. No. 808
Model 1-18 Van Norman Vertical Miller, Ser. No. 18-50666
No. 0 Sundstrand Rigidmil, Ten available
No. 00 Sundstrand Rigidmil, Ten available
Model 12M Morey Profilers, Ten available
Model 420 Barnes Horizontal Drill, 2 spi, Ser. No. 709
304 Bliss Press, Two available
Model 308 Bliss Press.

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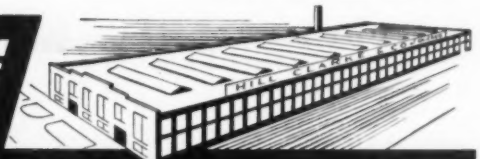

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CATERPILLAR TRACTOR CO. uses this Hill-Clarke 1A Warner & Swasey Turret Lathe to make parts for water pumps, governor housings, pulley connections and miscellaneous special parts. The machines purchased by Caterpillar Tractor Co. from Hill-Clarke for past 38 years have given very satisfactory service.

AUTOMATICS

⅞" Model G 4 Spndl. Gridley
1⅛" Model A Cleveland (1942)
1½" Foote-Burt
1¾" Model G 4 Spndl. Gridley

DRILLS

2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
D-31 Fox Multiple Drill

GEAR MACHINES

No. 12 HS Gould & Eberhardt Hobber
No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester (1942)
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

3" Lucas Hor. Bor. Mill.
Rockford—3⅛" Bar
42" N-B-P Vert. Bor. Mill.
72" Niles—Hvy. Pattern

GRINDERS

4"x18" Landis, Model 4H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C (1943)
10"x72" Landis Type C Hydraulic
Hill-Clarke Norton Type Motor Driven Grinders
- 10"x36" centers
- 10"x50" centers
- 10"x72" centers
- 10"x96" centers
- 14"x36" centers
- 14"x72" centers
- 16"x120" centers
- 16"-40" gap x 120" centers
- 18"x96" centers
- 18"-30" Gap x 96" centers
- 20"x96" centers
- 24"-32" Gap x 144" centers

26"x72" Norton Crank Shaft Grinder
15"x15"x8' Norton Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 16-26" Blanchard Rotary Surface
No. 5B Bryant Internal
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
19"x8' Le Blond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 5 B & O Tur. Lathe, Cone Hd.
No. 6 Warner & Swasey Tur.-Bar Fd.
2¼"x24" Jones & Lamson
No. 2A Warner & Swasey s.p.d.
No. 3A Warner & Swasey (1941)
20"x8' Fay and Scott
18" Libby Tur. Lathe, M.D.
21" Gisholt, M.D.

MILLING MACHINES

No. 08 Cincinnati Plain
No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x36" Lees-Bradner — Model LT (1943)
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney Thread (1942)
10"x60" Pratt & Whitney Thrd. Mill

MISCELLANEOUS

No. 151 Besley Dbl. End Disk Gdr.
24" Lutter & Geis Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
18" Newton Slotter
No. 0 Bakewell Tapper
Baush Radial Tapper
No. 307 Barnes Hone
Model 200 Micromatic Horiz. Hone, 1 Spdl.
Model H-2 Micromatic Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.6 bushel capacity
75 Ton Hannifin Hyd. Press.
No. 6 R & K Straight-side Press, M.D.
4-B Marvel Hack Saw
48"-14 Ga. Economy Shear, M.D.
No. 5 Reynolds Power Screw Driver

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.

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3. You can see your machine run and tested under power in our plant before purchasing.
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AUTOMATICS

6"x6¾" Goss & DeLeeuw
3¾" S.S. Cleveland Model A
5½" 4-Sp. Cleveland Model M Chucker

BROACHES

15-Ton 48" American Horiz., Double Rack
40-Ton 40" American Vertical

BORING MILLS

8" Niles Horizontal
24" Bullard Vertical
36" Bullard Vertical
42" King Vertical
42" Niles

DRILLS & RADIALS

S.S. Barnes 20"—#3 M.T.
S.S. Cincinnati 22"—#4 M.T.
S.S. Rockford 24"—#4 M.T.
6-Sp. Foote-Burt
6'17" Carlton Radial

GEAR EQUIPMENT

#3 Gleason Spiral Bevel Gear Generator
15" Gleason Hypoid Generator
37" Gleason Gear Planer

FURNACES

30 KW Leeds & Northrup Homo Nitriding
40 KW Tocco Unit with Starter
1250° Lindberg Gas Furnace

GRINDERS

#3 Brown & Sharpe Universal 14"x40"
#4 Brown & Sharpe Universal 14"x60"
#5 Bryant Chucking—Internal
#12 Bryant Flange Type Work Spindle
#22—12" Heald Rotary Surface
#31 Ex-Cell-O Precision Thread
#33 Abrasive 8"x24" Surface Grinder
#84 Gardner Disc Grinder
#104 Rivett
#205 Besly Double End—18" Discs
6"x18" Norton Surface
8"x48" Jones & Lamson Automatic Thread
10"x18" Fitchburg Angular Head
30"x160" Lobdell Roll

MILLS

#000 Brown & Sharpe Plain
#1 Kempsmith Plain
#33 Kempsmith Duplex
24" Cincinnati Duplex
Hall Planetary Model C Thread

LATHES

#2 Warner & Swasey Turret
#3A Lodge & Shipley Duomatic
SD Potter & Johnson Turret
2½"x24" Jones & Lamson Flat Turret
5"x24" Seneca Falls Model U Lo-Swing
16" LeBlond G.H. Engine Lathe
18"x72" Hendey
21"x84" LeBlond Geared Head
24"x10' B.C. American Hi-Duty
42"x17' Bed Pond Engine—8' B.C.

PRESSES

#41 Toledo Horning & Wiring
90-Ton #82-C Toledo
243-Ton, #95-D Toledo
100-Ton HPM Hydraulic

POWER LIFT TRUCKS

Baker-Rauling Fork Lift—4000#
Yale Cam-O-Tractor Platform Hi-Lift

SHAPERS

18" Betts Vertical Shaper (Slotter)
25" Smith & Mills Shaper, Square Ram

MISCELLANEOUS

8' Hill & Jones Plate Bending Roll
Ship Plate Cutting Torch
Yoder Hammer 36" Stroke
Manville Header 150 Ton
Barnes Hone, Model 307-B
#10 Airco Planograph
Hypressure Steam Jenny
#2 Garvin SS Tapper
1"x8" Ajax Upsetter

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LATHES

Niles 48"x30' ctrs. QCG., Geared Head, Hvy Dty. 2 carriages, taper attachment, power rapid traverse, AC, MD—late type.

LeBlond #2 Deep Hole Boring Lathe (1942)—swing 18½"—hole thru spindle 5⅛"—stroke 10'—excellent condition.

Seneca Falls 8"x108" ctrs. Lo-Swing Lathe—swing 13½"—automatic work drive assembly—two power feed carriages—MD—late type.

Niles 60"x26½' Geared head Engine Lathe—16' ctrs.—MD.

BORING MILLS

Sellers 100" Vertical Boring Mill with swing extended to 14'—2 swivel heads—54" under cross rail—MD.

Betts 96" Vertical Boring Mill, actual swing 108"—62" under tool holders—69" under cross rail—2 swivel heads—MD.

Bullard 24" "New Era" Type Vertical Boring Mill—4-jaw chuck table—side head, MD.

GRINDERS

Cincinnati 6"x30" Plain Hydraulic Grinder—wheel spindle reciprocating atch—automatic infeed—4 motor drive—1944 machine.

Landis 8"x18" Type "C" Hydraulic Cylindrical Grinder—4 motor drive—power rapid traverse—late type.

Brown & Sharpe #1 and #2 Universal Grinders—late type with large assortment of tooling.

MILLERS

Brown & Sharpe #2A Universal Miller, speeds from 21 to 496 rpm—dividing head—vert. attchmt.—slotting attchmt.—motor-in-base—late type.

Cincinnati #3B Plain Horizontal Miller—vertical attchmt.—motor-in-base—late type—power rapid traverse.

Brown & Sharpe #3A Constant Speed Universal Miller—dividing head-range 34"x12"x19"—MD.

Cincinnati #3 High Power Vertical Miller, range 3½"x13"x14", power rapid traverse—MD—late type.

Cincinnati #56-96 Plain Hydromatic Miller—range 96"x8"x13¼"—table 24"x119⅛"—late type.

Foster #2FU and #4FU Fastermatics, capacities 3"x23¾" swing and ⅝"x35½" swing—late types with large assrt. tooling—used only a few months.

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SETS OF HIGH SPEED DRILLS

#1-60 H.S. Drills, 60 Drills W/Stand, Set $13.00

1/16-1½" H.S. Drills, 29 Drills W/Stand, Set $17.00

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½" to 1" H.S. Drills by 64ths, Straight or Taper Shank, 33 Drills, Set $110.00

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USED MACHINERY

Baush 44" Hvy. Duty Vert. Boring Mill, 2 Hds.
Bullard 36" New Era Vert. Turret Lathe with side head
Hilles & Jones 2" Cap. Guillotine Shear
Brown & Sharpe No. 2 High Speed Vert. Miller, 1942
American 4' Enc. Head Radial Drill 12" col.
Dill 18" Str. A.C. M.D. Vert. Slotter adj. head
G & L and Universal 3" Bar Horiz. Boring Mills
20" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½" Arm Radial Drills
Blanchard M.D. Vert. Sp. Surface Grinder 26" chuck
L & S 20" x 8', 18" x 21', 20" x 10', 28" x 12'
Monarch 20" x 8', Amer. 20" x 12' grd. hd. q.c.g. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin No. 3 Mill, No. 2-B & 3-B, Cin. No. 5 LeBlond, No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mill, No. 2-B, Cin. No. 1-M, Cin. No. 2 Grd. Hd. Univ. Millers
Campbell No. 213 abrasive cut off.
Brake D & K Leaf type Power 10' Length ⅝" Capacity
Bullard 24" & 38" Vert. Turret Lathes
Lynd-Farquhar 26" stroke openside Shaper Planer
Lo-Swing R-14 late production Lathe
K&T No. 2K Universal Miller
Avey 2-Spindle MA6 Drill Press late.
Cin. 24" M.D. Univ. Shaper.
Cleveland 48" x 12' Table Openside Planer, 3 Hds.

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FOR SALE OR RENT
LATEST TYPE

J&L No. TG1245 Thread Grinder
Monarch 33½"x120" cc G.H. Engine Lathe, Pan Bed (1947)
L & S 24"x192" cc G.H. Engine Lathe, Pan Bed
American 27"x96" cc G.H. Engine Lathe, Pan Bed
Gleason 12" Bevel Gear Finisher
Pratt & Whitney Keller Type "G"
Norton 6"x30" Cyl. Grinder, Hydr. Table & Head Traverse
H & W 10"x48" Thread Miller.

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197-199 MOTT STREET
NEW YORK 12, N. Y.

#2207 Kearney & Trecker Simplex Production Mill, 7' table travel, Timken bearing, 22"x134" box table, M-1-B
24" Bullard Vertical Boring Mill, spiral drive, 14,000 serial
54" Colburn Vertical Boring Mill, 2 swivel heads, motor drive
Air Compressor: 294 C.F.M. Worthington, late type
Tube Bender: 500Y-4 Wallace Rotary, Hydraulic
Grinders: 73A Heald Airplane Cylinder, late type
112 Bryant Internal, late type
A-1-S Arter, Rotary Surface, late type
6 x 18 La Salle Surface, late type
Milling Machine: #3 K & T Rotary Table, for rotary milling only
Vertical Shaper: 12" Jones, A.C.M.D., late type
Square Shear: 6' 12 Ga. Stamco, M.D., new 1945
Turret Lathe: 3R Gisholt, 5¼" hole, universal, late type

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#10 Blanchard High Power Vertical, m.d.
Arter Model A-1-8" Rotary, m.d.
No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d.
No. 16 Blanchard Rotary, m.d., 26" chuck
No. 112 Hanchett Production Face Grinder, type BD, m.d.
No. 22—12" Heald Rotary, m.d.
No. 33 Abrasive Vertical, m.d.
No. 268—10" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical, m.d.
54" Bridgeport Knife, belt
84" Diamond H.D. Face Grinder, m.d.
No. 7 Ultralap Lapper, m.d.

TOOL & CUTTER GRINDERS

Cincinnati Monoset, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 2 Lumsden Oscillating Tool Grinder, belted m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
No. 6T Sellers Tool, m.d., latest
No. 1 J & B Tap Grinder, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d.
Black Diamond Drill Grinder, m.d., cap. 1/8" to 1/2" drills
Gould & Eberhardt Gear Cutter Grinder, 2 step cone pulley belt drive
Sellers Wet Drill Grinder, m.d.
Gisholt Universal Tool Grinder, belt

HONING MACHINES

H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle Honing Machine, m.d.

ENGINE LATHES

12x24" LeBlond Regal Geared Head, m.d.
12x30" centers Monarch Geared Head, m.d.
12"x8' Lodge & Shipley Geared Head, m.d., taper
13x30" centers Pratt & Whitney Model B, m.d., taper
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
14"x8' Sidney Geared Head, m.d.
15"x6' LeBlond Geared Head, m.d.
16"x36" Pratt & Whitney Geared Head, m.d.
16"x58" centers Pratt & Whitney, cone, motorized
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' LeBlond, cone
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' Lodge & Shipley, cone
16"x6' bed Monarch Geared Head, m.d.
16"x8' Sebastian, cone
17"x6' LeBlond Geared Head, m.d.
18"x48" centers Lodge & Shipley, m.d., taper
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x6' Monarch Geared Head, m.d.
18"x6'6" Greaves-Klusman Geared Head, m.d. in leg
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' bed Boye & Emmes, m.d., taper
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Champion, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x10' Bradford, cone, motorized
18"x10' Greaves-Klusman, cone, motorized
18"x12' centers American High Duty Geared Head, m.d., late type
18"x20' Monarch Geared Head, m.d. in leg
19"x8' LeBlond, cone
20"x8' bed American Geared Head, m.d., taper
20"x8' Cisco, cone
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x10' bed Lodge & Shipley Geared Head, m.d.
20"x10' Sidney Geared Head, m.d.
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
22"x10'6" Greaves-Klusman, cone, motorized
23"x12' LeBlond Geared Head, m.d., taper
23"x14' bed LeBlond Geared Head, m.d., taper
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x13' bed Lehmann Geared Head, m.d., taper
24"x18' Lodge & Shipley Selective Head, m.d.
25"x10' LeBlond, cone
26"x8' Bridgeford Geared Head, m.d.
27"x10' centers American Geared Head, m.d., taper
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d.
36"x36'6" Niles Heavy Duty, m.d., latest, 2 carriages
36"x38' American Triple Geared Internal Face Plate Drive, m.d., taper

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LONG BED AUTOMATIC LATHE

#3A Lodge & Shipley Duomatic, late type, 22" swing, 171" centers, with 2 front and 2 rear carriages, power cross feed, coolant, pan, 25 H.P. motor. New 1942.

Abrasive Cutoff, #213 Campbell, 7½ H.P., late.
Automatic, 0G Brown & Sharpe, M. in base.
Bending Roll, 8' x ½" Newbold, pinch, all steel, 1940.
Boring Mill, #32 Lucas 3½" table type, PRT.
Boring Mill, 60 Gisholt, vertical, 2 hds.
Boring Mill, 44" Bullard Maxi-Mill, Vert. PRT, M.D.
Boring Mill, 3½" N-B-P, horiz. table type.
Boring Mills, 54" Colburn, vertical, 2 hds., M.D.
Boring Mills, 36" Bullard vert. turret.
Drill, 3 spindle, #2MS Leland Gifford, Mtr. Spdles.
Drill, Radial, 6' Dreses, gear box, M.D.
Drill, Radial, 8' Western, gear box, M.D.
Drill, Radial 6'x17" American, M.D.
Gear Hobber, #36H Gould & Eberhardt univ.
Gear Lapper, Type 10LS Fellows, 1942.
Grinder, Cylindrical, 6"x18" Cincinnati Filmatic, 1943 (3)
Grinder, Surface, 8"x54" Thompson, M.D.
Grinder, Surface, #34 Abrasive Vert., '41.
Grinder, #5 Bryant, Internal, late
Lathes, Duomatic, #3A Lodge & Shipley, 171" c.c., double carriage 1942.
Lathe, 36"x16' American 18 speed grd. hd., M.D.
Lathe, 6—20"x10' Americans, 12 speed grd. hd., M.D.

For: Quality and Integrity!!

Get the best! Good machinery, properly reconditioned and fully guaranteed. Here are a few representative items from stock.

Lathe, 54"x20' Johnson, taper, M.D.
Lathe, 36"x30' Putnam, grd. hd., M.D.
Lathe, 24"x9' c.c. Reed-Prentice, grd. hd.
Lathe, Automatic, 12"x24" Lipe-Carbo.
Lathe, Production, 8"x60" Lo-Swing, late.
Miller, Production, #1-12 Cincinnati, 1942.
Miller, Universal, #4 Cincinnati, Hi-Power, M.D.
Miller, Plain, #1½B Milwaukee, M.D.
Miller, Vertical, #14 Cochrane Bly, slot, attach.
Planer, 36"x36"x12' Cincinnati, 2 hds., M.D.
Shaper, 32" Cincinnati, gear box, M.D.
Shear, Rotary, #6 Quickwork 48"x1"
Turret Lathe, #2A Warner & Swasey, collets.
Turret Lathe, #0 B. & S. wire feed, collets, 1942.
Turret Lathe, #2 Bardon & Oliver, 1943.
Welder, 50 KVA Acme air-press, spot, timer, late.

PIPE THREADERS: 3—#8R Oster "Rapiduction" 8" cap. M.D., 1943; 1—8" Landis, 4½"-8" cap., AC M.D.; 2—6" Landis, 2½"-6" cap., AC M.D., latest type.

CABLE OBRIEN PHILA.

THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

PHONE GArfield 6-1150

1535 N. DELAWARE AVE., PHILA. 25, PA.

AUTOMATICS

5/8" No. 204 New Britain 6 spdl.
7/8" Gridley Model G.
1 1/2" Cone 4 spindle
No. 454 New Britain Chucking
14"x19" Fay
14"x18" Monarch Magnamatics

BORING MILLS

84" Gisholt
3" Rockford
4" Detrick & Harvey floor type
No. 5D Moline 6 spdl. cylinder bore

DRILLS

14" Leland Gifford 1, 2 & 4 spdl.
14", 4 spdl Buffalo sensitive
15", No. 2 Avey, 1 & 4 spdl., hydr. feed
16" Sipp, 2 & 3 spindle
24", No. 4B Edlund, power feed
20" & 24" Barnes all geared self oiling
24" Cincinnati
Nos. 121, 217, 310, 315 & 321 Baker
No. 217H Baker horizontal
Barnes horizontal radial
5' Carlton sensitive radial
6'-15" Dreses radial
16 spindle No. 13 Natco multiple
1 & 4 spdl. Avey No. 2, woodpecker feed
7 spdl. Moline horiz. hydr.
12 spdl. Defiance adjustable rail

GEAR CUTTERS

No. 6 Fellows shapers
Nos. 8H, 12H, 16H5, 18H G. & E.
No. 130 Cleveland Rigidnobber
No. 5A Lees Bradner nobber
4" Gleason spiral bevel
Gleason testers & lappers
Illinois involute tester
Red Ring shavers, lappers & speeders
24", No. 3 Adams Farwell nobber

GRINDERS, CYLINDRICAL

10"x18" Norton, plain & semi-auto.
10"x18" Landis hydraulic
10"x24" & 16"x72" Landis mechanical
14"x36" Landis hydraulic universal
10"x18", 10"x30" & 10"x50" Norton mech.

GRINDERS, INTERNAL

No. 75A Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross sliding, head
No. 72A3 Heald Sizematic
Nos. 16-28 16F28 & 24-36 Bryant
Grenby bench type

GRINDERS, SURFACE

Nos. 10 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
8" Pratt & Whitney rotary (tub)
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
14"x48", No. 5 Abrasive

MILLERS

No. 2A Milwaukee
No. 2 Cincinnati, horiz. & vertical
12" Cincinnati Plain Mfg.
18" & 24" Cincinnati plain automatic
No. 4-36 Cincinnati Hydromatic
18", 24" Cincinnati duplex
No. 1-8 Kent Owens hydraulic
Nos. 1, 2 & 3 Kent Owens hand
No. 1 Kent Owens semi-automatic
20"x84" table Ingersoll vertical
Ingersoll Rise & Fall
6 spindle Moline profiler
24"x18"x14' Ingersol planer
48"x24"x22' Ingersoll planer
30" Newton rotary
30", 42" & 84" Ingersoll rotary
No. CT 36 Less Bradner thread
Nos. 4 & 6 Lees Bradner Univ. thread

SHAPERS & PLANERS

24" Queen City Shaper
27" & 34" Morton Draw Cut Shapers
16" Bement Miles slotter
36"x36"x10' Betts planer
48"x48"x14' Woodward planer

MILES MACHINERY CO.
Box 770 SAGINAW, MICH.

LATE MODEL TOOLS

BORING MILLS

#31 LUCAS Horizontal Boring, Drilling and Milling Machine, 3" bar
#25RT G&L Horizontal Boring, Drilling and Milling Machine
36" and 42" BULLARD Vertical Turret Lathes

LATHES

12"x30" MONARCH Model CK Toolroom
20"x8' AMERICAN Geared Head Lathe

AUTO. LATHES & TURRETS

#2 B&O Geared Electric Turret Lathe
#5 B&O Ram Type Univ. Turret Lathe, pre-selector head
#5DE POTTER & JOHNSTON Aut. Turret Lathe
#6S POTTER & JOHNSTON Aut. Turret Lathe

MILLING MACHINES

#2HL K&T Plain Miller
#1M CINCINNATI Vertical Miller, 1941
#26 VAN NORMAN Ram Type Universal Miller
#12M MOREY 2-spindle Vert. Miller and Profiler, 1942
36"x36"x10' INGERSOLL Adjustable Rail Planer Type Miller, 40 HP AC motor drive, one rail head, two side heads
#08 CINCINNATI Plain & Vert. Aut. Millers

GRINDERS

6"x18" LANDIS Type C Plain Grinder
10"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vert. Spindle Surface Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder, 1942
16"x96" LANDIS Type B Pl. Cyl. with Gap Bed
#16-28 BRYANT Hyd. Internal Grinder
#174 HEALD Hyd. Gap Internal Grinder
#2 NORTON Tool and Cutter Grinder
#2 CINCINNATI Univ. Cutter and Tool Grinder
#73 HEALD Internal Centerless Grinder
#TG-185 JONES & LAMSON Internal Thread Grinder, new

DRILLS

#2LMS LELAND GIFFORD 2-spindle on 4-spindle base
#3MS LELAND GIFFORD 2-spindle, hyd. fd.
#425 BAKER S.S. Heavy Duty Drill
4'9" CARLTON Radial Drill, 1941

GEAR EQUIPMENT

#725A FELLOWS High Speed Gear Shaper
#36BM GOULD & EBERHARDT Gear Rougher
#12 FELLOWS Gear Shaver

MISCELLANEOUS

36"x36"x10' CINCINNATI D.H. Planer, 3 heads, M.D.
15" BETTS Vertical Slotter
#3L LAPOINTE Hyd. Broach, 1945
16" GEMCO Shaper, M.D.
#1½B P&W Two Spindle Reaming Machine, 1944
4¾"x36" P&W Model C Thread Miller
Model H-1 MICROMATIC Hydrohoner
6" TAYLOR & FENN Spline Millers
7/8" CONOMATIC 4-spindle Aut. Screw Machine
4⅝" CONOMATIC 4-spindle Auto. Screw Machine
#1 BAKEWELL Precision Tapping Machine

WIGGLESWORTH INDUSTRIAL CORP.
203 BENT ST., CAMBRIDGE 41, MASS.-KIRKLAND 7-5242

ASHLAND HAS PRESSES!!

TOLEDO No. 94C Double crank, 161 Tons, Bed 36"x48", Stroke 7", Dayton Rogers Air Cushion, Mtr. & Cont. Excellent condition.
PERKINS 200 ton Knuckle Joint Coining Press, Tie-Rod, Motor and Controls. Excellent Condition.
CLEVELAND No. 6K 600 Ton Knuckle Joint Coining Tie-Rod Stroke 4", Bed 20x24.
HENRY & WRIGHT 25 Ton Dieing Machine, New in 1930 with double roll feed.
HENRY & WRIGHT 50 Ton Dieing Machine with roll feed, 2" stroke. Manufactured 1941.
2—BLISS No. 75½ Straight Side 125 Tons each, 25"x25" Bed, 5" & 8" Stroke.
3—WATERBURY FARRELL No. 6600, Dbl. crank, 5" Stroke, 10"x16" Bed, Geared, Motor and Controls, 88 Tons.
BLISS No. 1 Double Action Toggle Drawing, 59 Ton, Plunger Stroke 7", Blankholders Stroke 3½", Excellent.
BLISS No. 304, 56 ton, 8" Stroke, Bed 18"x18".
FERRACUTE No. P-3 Styles Type, 30 Ton, 1¼" Stroke, Motor and Controls.
FERRACUTE No. SG73 Double Crank 7¼" stroke, 12"x50" Bed, Geared, Motor and Controls. 88 Tons.
TOLEDO No. 52 Inclined Arch Press, 3" Stroke, 45 Tons, 28"x28" Bed.
CONSOLIDATED No. 74 50 Ton Open Back Gap Press. Complete with Motor and Controls.
R & K O.B.I. 40 ton Punch Press, 3" stroke. Excellent.

OHL Heavy Duty Press Brake 10'x⅜", 275 ton capacity, 4" stroke, 8" diameter shaft, 10½" die space. Used very little on light stock. Mtr. & Cont.

ASHLAND MACHINERY COMPANY
555 W. Adams St. Chicago, Ill.
DEarborn 2-2047-8-9

FOR SALE

1—Lees Bradner Thread Milling Machine, 10"x72", Serial No. LT-488.
1—Kling Friction Saw, Serial No. 3328, 48" down stroke, complete with 75 H.P. 1770 RPM 220/440 V., 3-phase, 60 cycle motor, and 1½ H.P. hydraulic feed, including magnetic starter and controls. NEVER USED.
9—Rome Polishing Lathes, Model M1-30 HD, including enclosed 30 H.P. motor, 220/440 V., 3-phase, 60 cycle, double end spindle, speed 2400 RPM.
1—Rome Polishing Lathe with two 7½ H.P. motors, 220/440 V., 3-phase, 60 cycle, spindle speed 2600 RPM, model ROD.
16—Polishing Machines—Crozier, single spindle, vacuum grip work holding heads for rotating work in polishing operation including ¾ H.P. motor, 220/440 V., 3-phase, 60 cycle.

NORRIS-THERMADOR CORPORATION
P.O. Box 15384 Los Angeles
Vernon Branch California

STEEL FOR SALE

45 Ton—H.R. Mild Prime Angle—1 x 1 x 1/8 20'

Located—Miami, Florida

H. R. Mild Strip in Coils

3.9" x 18 Ga.	65 Ton
3.35" x 16 Ga.	25 Ton
3.15" x 18 Ga.	25 Ton
5.9" x 15 Ga.	85 Ton
2.75" x 20 Ga.	28 Ton

Located—New York City

FOB • CAR — TRUCK — DOCK
FLORIDA STEEL SUPPLY CORP.
HIALEAH, FLORIDA
P O Box 486 Tel. 88-5222

FOR SALE

H.P.M. Hydro Power Hydraulic Pump R-200—95 g.p.m. 2000 lb. L.P. reservoir—cooler—valves.

ARTAG ENGINEERING CORP.
655 S. Wells St. Chicago 7, Ill.

#2 Cincinnati Centerless Grinder 1941

#73 Heald Airplane Cly. Internal Grinder

#3A & 4A Warner & Swasey Turret Lathes

2L Gisholt Turret Lathe

100 ton Dries & Krump Punch Press

VICTOR MACHINERY CO.
135 SOUTH CLINTON ST.
CHICAGO 6, ILL.

Sutton single cross roll
BAR STRAIGHTENER
Timken bearings, motor driven,
1¼" capacity.
W. C. COWDEN MACHINERY CO.
SYRACUSE 4, N. Y.

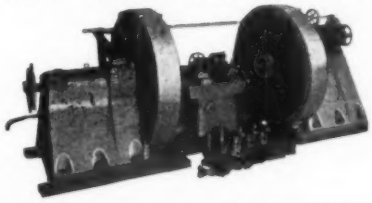
Turret Lathe, NEW #4 Morey, with A. C. electrical equipment.
American, 24"x16' geared head lathe, like new with motor driven quick traverse.
Milling Machine, B & S #5B, plain, with A. C., 20 HP Motor, V-Belt Drive.

GUYAN MACHINERY COMPANY
Logan, W. Va.

EMERMAN *Offers from* STOCK

FOR PRODUCTION—LATHES

90" x 22" PUTNAM HEAVY PATTERN DRIVING WHEEL LATHE



With: Calipering attachment; journal attachment; and quartering attachment.

Arranged for chucking locomotive driving wheels.

Face plates with 3 Putnam non-slip driving dogs.

Capacity of lathe: 90".

Minimum and Maximum of engine for which quartering may be done 24" to 36".

Direct connected motor drive with 50 H.P., 7½ H.P., 3½ H.P., 230 volt D.C. motors and controls.

Approximate weight: 116,000 lbs.

No. 4FU FOSTER FASTERMATIC AUTOMATIC TURRET LATHE

Swing: Over bed 35½"; over cross slide 20".

Head: Spindle speeds 9 to 484 R.P.M.

Diameter hole through spindle 5⅛".

Timken bearing spindle.

Cross Slide: Width 10"; length 25".

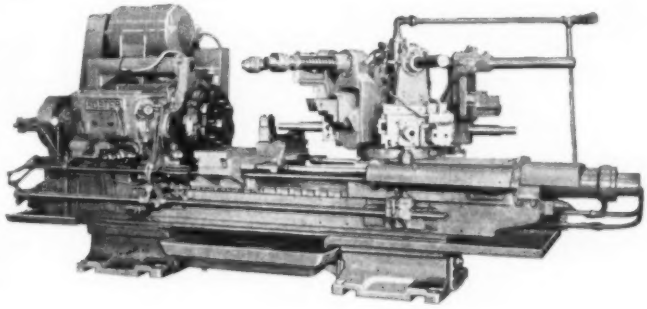
Maximum cross travel 6".

Maximum distance spindle nose to turret face 59½".

Hardened ways.

Motor Drive: Motor drive w/20 H.P. motor and controls.

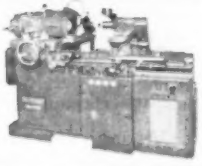
NOTE: 4F Foster Fastermatics PLATEN TYPE, hardened ways, same speeds and feed as above machine, except equipped with platen instead of turret. Excellent condition. Many available.



EMERMAN MACHINERY CORP.

875 W. 120th STREET — **CHICAGO 43, ILLINOIS**

GOOD MACHINE TOOLS



In twelve years of business, we've earned the confidence of many hundreds of customers. Now, new plant facilities assure even faster delivery and larger stocks.

No ad alone will convince you of the quality of our machines—your first purchase will! Tell us your needs today.

Immediate delivery! No. 112 BRYANT Precision Hydraulic Toolroom Internal Grinder. Hi-speed spindle. Chuck swing, 16"; Grinding stroke, 9"; Max. wheelslide traverse stroke, 20". Top condition.

ONE SHOWN—HUNDREDS IN STOCK!

REBUILT BY CINCINNATI'S SKILLED MACHINE TOOL CRAFTSMEN

Tools Machine

LAURENS BROS., INC.

2740 HIGHLAND AVE. CINCINNATI 12, O.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
ROBERT GUARANTEED

ELITA

JOSEPH HYMAN & SONS

Tioga, Livingston and Almond Streets
Philadelphia, Pa.

LEAF BRAKE

12'x¼" DREIS & KRUMP. AC MOTOR DRIVE.

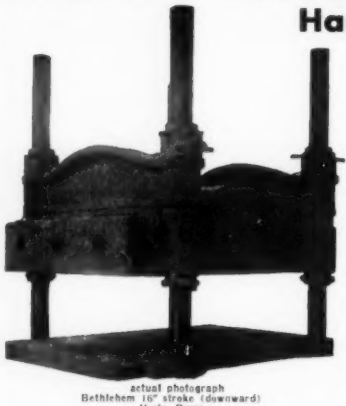
WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

1—Practically New HANNA 80-ton Portable & Stationary Pneu. Yoke Riveter, ser. 6456, reach 75", gap 24", complete with feet & bail suspension. New 1947. Very little use.

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

MANY ATTRACTIVE "BUY"S in

Hard-to-Find HEAVY MACHINERY and SHEET METAL EQUIPMENT WELL-WORTH INVESTIGATING!



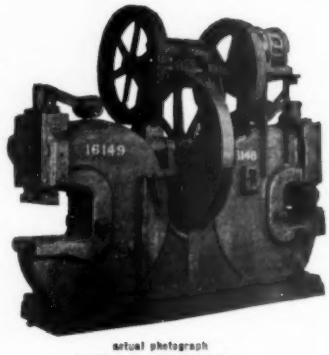
actual photograph
Bethlehem 16" stroke (downward) Hydr. Press

POWER PRESSES

TOLEDO #88, 16" stroke
BETHLEHEM STEEL Hydr. flanging (downward) cap 1200 ton; 66" strk
MACKINTOSH-HEMPHILL hydr. (Upward) 60" stroke; intensifier
BETHLEHEM 16" stroke hydraulic
MACKINTOSH-HEMPHILL 4-post hydr., 24", 36", 60" strokes

PUNCHES—MULTIPLE

SOUTHWARK 400 ton, 7" stroke
WILLIAMS & WHITE, 6" str. Vert.
CLEVELAND #1, 6" stroke
HILLES & JONES #3 Vertical
MASSILLON #5, 60" stroke



actual photograph
LONG & ALLSTATTER Size B Vertical Punch

ALSO AVAILABLE

CAR WHEEL BORING LATHE—BETTS-CONSOLIDATED
AXLE LATHE—NILES TOOL WORKS
FORGING MACHINES—FORGING ROLLS—AJAX
HAMMERS—Forging, Steam; ERIE, CHAMBERSBURG
and many other machine tools and Sheet Metal Equipment

WIRE 'PHONE or WRITE — or better still — INSPECT!

McKEES ROCKS INDUSTRIAL ENTERPRISES

Nichol Av. **PHONE FEderal 1-0746** **McKees Rocks (Pittsburgh) Pa.**

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Each advertisement represents a current Want or Offering of an organization or individual in this field, with some element of profit in each for whoever can fill the need. Some have money-saving possibilities, others are opportunities for more business; many are employment opportunities; still others offer property, or equipment used or surplus new equipment.

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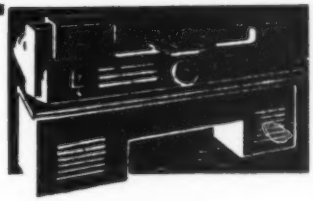
Restrictions or no restrictions— a reliable dealer means a reliable product . . .



For a better buy you better buy a Motch & Merryweather Machine

Whether you are operating in a restricted economy or in a highly competitive market if your customer has confidence in you he also has confidence in your product.

Over the past 45 years Motch & Merryweather has gained the confidence of a host of used machine tool buyers. They have gained this confidence through a continuous, complete service to their customers.

For example; the Motch & Merryweather sales force is composed of trained engineering salesmen. Each is well versed in machine tool construction, maintenance and operation. He can interpret your needs in the light of production and help you select a machine best suited to your conditions.

This sales force has behind it an experienced skilled group of technicians plus the most modern plant facilities devoted exclusively to reconditioning and rebuilding machines for the metal working industry.

It is because of this long service to the metal working industry—the skilled force of operating personnel—and the modern plant facilities that Motch & Merryweather has become universally recognized as a reliable source for dependable machines.

THE MOTCH AND MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT CINCINNATI PITTSBURGH

USED MACHINE DIVISION 1250 EAST 222ND STREET EUCLID 17 • OHIO

SHELL DRAWING PRESS

30" stroke, 200 Ton Verson Model #40 ES, 1943 machine, Straight Side, 30 HP motor.

TOGGLE DRAWING PRESS

500 Ton, Model #410-A, "Bliss", 62" shut height, 60" x 84" bed area.

DOUBLE CRANK PRESS

255 Ton, Model #96-D Toledo Try-Out Press, 30" shut height, 42" x 84" bed.

Also

150 Ton, Model #60-D-84, Cleveland 12" stroke, 30" shut height, 46" x 86" bed.

PAUL'S MACHINERY CO.

6111 VERMONT DETROIT 8, MICHIGAN

ROLLER LEVELLERS

McKay ½" to 2", 4 High Leveller, 17" dia. rolls, 13 rolls, backed-up, 1943 machine, 350 HP motor, Selling for 1/5 of New Cost, Used only 6 months.

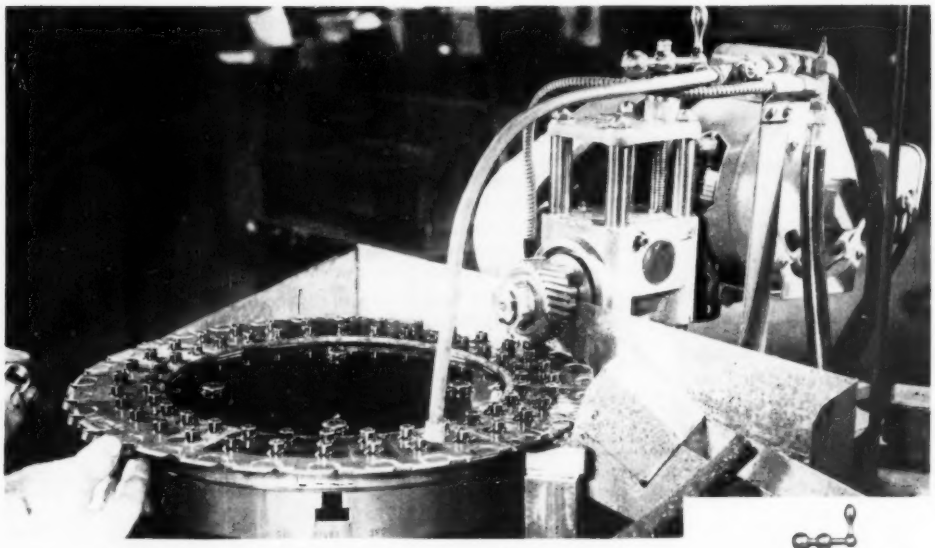
McKay ¼ to 2", 2 High Hot Plate Leveller, 15" dia. rolls, 150 HP, 13 rolls.

PAUL'S MACHINERY CO.

6111 VERMONT DETROIT 8, MICHIGAN

PRODUCTION INCREASE···150%

Continuous Miller...made from readily available parts...helps Heli-Coil step up output

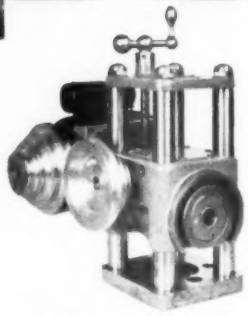


A VERSA-MIL BASIC UNIT, mounted on frame of a discarded drill press, combined with motorized rotary table and work-holding plate, makes a continuous miller for squaring ends of thread inserts for Heli-Coil Corporation. Number of pieces per hour, 2½ times that obtained from #1 Miller previously used.

VERSA-MIL may also provide you with an immediate, low-cost solution to many of your machining problems. You need not wait for additional new machine tools.

VERSA-MIL is a rugged, direct-powered tool, built to machine tool precision standards. It may be combined with machine tools you now have to provide a wide range of additional functions; milling, drilling, boring and grinding, at spindle speeds from 44 to 18,000 rpm.

Our new 24-page Bulletin #4, containing specifications and capacities, and illustrating typical uses, may ease machine tool difficulties for you. You may have your copy by writing to VERSA-MIL, 30 Church Street, New York 7, N.Y.



BASIC UNIT mills, drills and bores at spindle speeds from 44 to 450 rpm. 2 sizes, capacity up to 1" keyway 1½" per minute in mild steel. Accessory heads add higher speeds and wide range of angular positions.

Get EXTRA MACHINE TOOL CAPACITY with

VERSA-MIL

Trade Mark

The Tool for Precision Milling, Boring and Grinding

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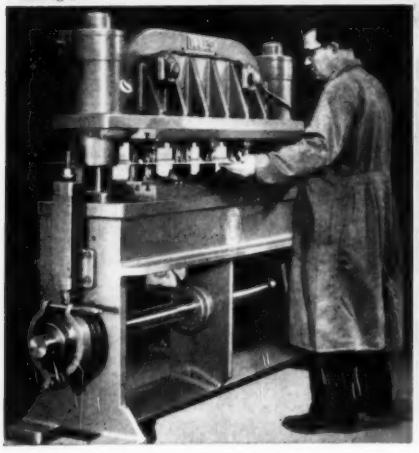

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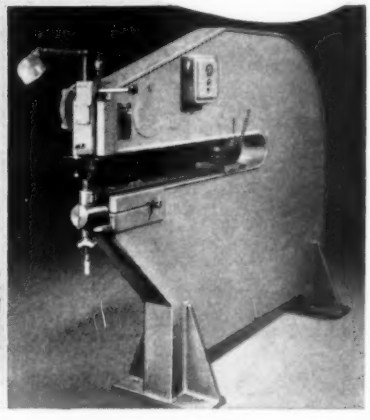

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Specialists in Punching and Notching Equipment

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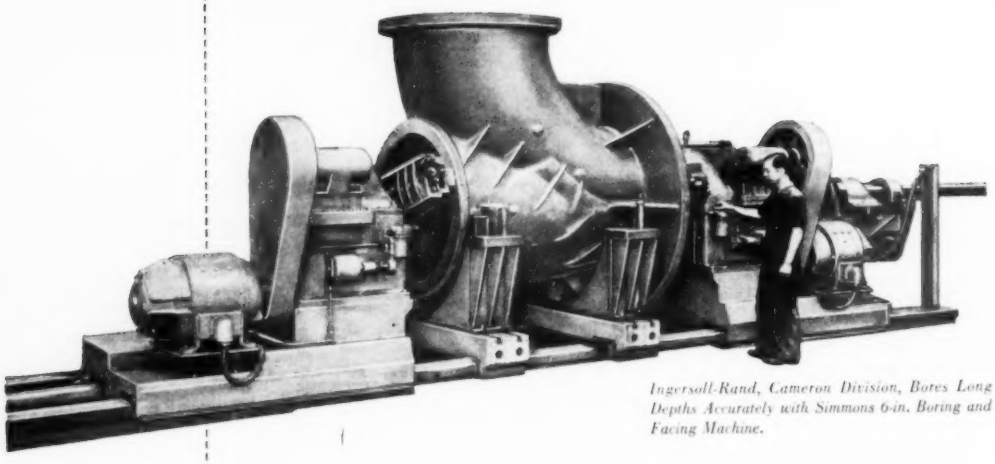

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Have you a similar deep boring job?

Precision boring and facing of large castings is an important step in manufacturing centrifugal mixed-flow pumps. Speed and accuracy are prime requirements: that's why you find a Simmons 6-in. Bar Horizontal Boring and Facing Machine doing the job at Ingersoll-Rand Company.

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4. **A range of bar speeds between 3 and 200 rpm and bar feeds from 0.0005 in. to 0.500 in. per revolution can be furnished with this machine.**
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The Simmons 6-in. Bar Horizontal Boring and Facing Machine is ruggedly built, and offers precision performance. The motor drive (up to 50 h.p.) handles the largest boring jobs with ease. Precision anti-friction bearings and alloy-steel gearing are used throughout. Standard bar length is 17 ft., travel in one setting is 72 in. Bed lengths and widths can be supplied to meet your needs.

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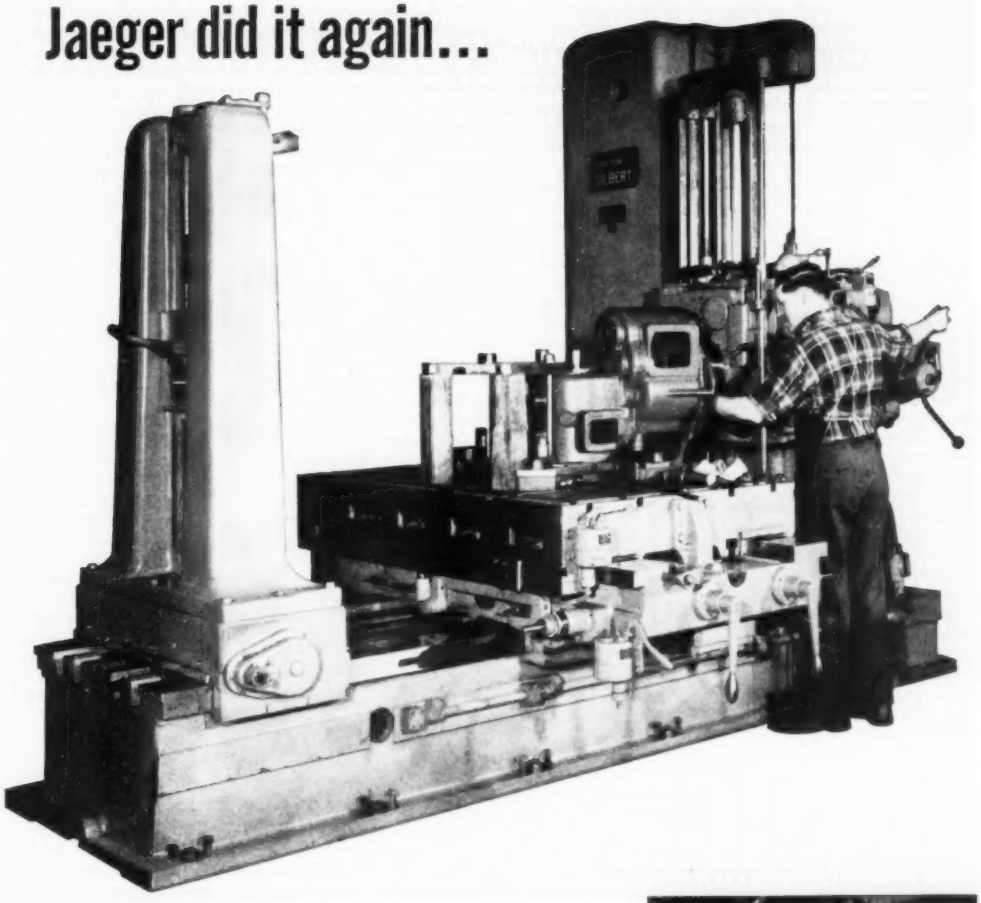
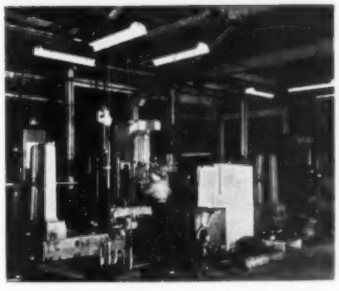
Jaeger did it again...



...five times

Shown above is one of four Cincinnati Gilbert boring mills on the job at The Jaeger Machine Co., Columbus, Ohio, well-known builder of construction machinery. A fifth is on the way. That's pretty good evidence that Gilberts pay off: Gilbert operators can *feel* the smooth precision of their machines; management can *measure* the high return per dollar invested . . . As a repeat customer, Jaeger is not alone. Better than 60% of Gilbert users have come back repeatedly for more of the same . . . Write for Bulletin 1244-B.



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MACHINE TOOL COMPANY

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3 reasons why TIMKEN® steels give you better forgings at lower cost

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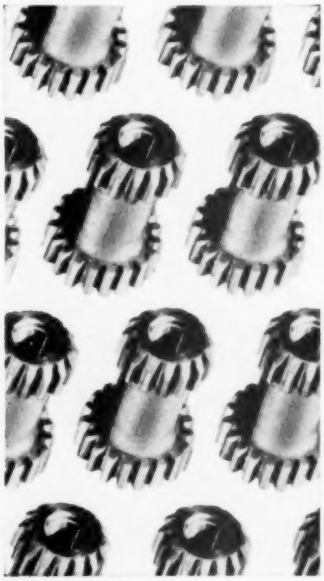

2. **HIGH QUALITY!**

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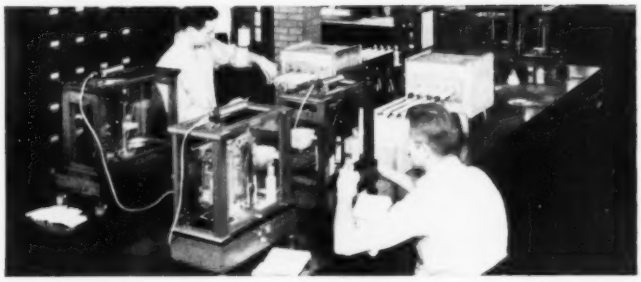

1. UNIFORMITY! You get uniform composition, uniform forgeability and uniform response to heat treatment with Timken® forging steels. Rigid control and inspection methods insure this uniformity from bar to bar and heat to heat. Result: better finished forgings.

2. HIGH QUALITY! Because Timken forging steels have superior surface and internal qualities and uniform forgeability, you get better finished forgings. Rejects, delays, and shop practice changes are reduced.

3. TAILOR-MADE! Constant testing, plus advanced melting and finishing techniques keep the chemical and physical properties of Timken forging steels to your exact specifications.

If you have any kind of forging problem, call on our Technical Staff for assistance. And write on your company letterhead for our Technical Bulletin No. 31—a compact list showing chemical composition of Timken alloy and stainless steels. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.